PERFORMANCE OF ARMY ENGINES WITH LEADED AND UNLEADED GASOLINE. PHASE II. FIELD STUDY EVALUATION

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Southwest Research Institute

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PERFORMANCE OF ARMY ENGINES WITH LEADED AND UNLEADED GASOLINE

PHASE II - FIELD STUDY EVALUATION

FINAL REPORT
AFLRL NO. 54

by

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All gasoline powered vehicles and equipment at four US Army installations were operated for 12 months on VV-G-001690 Regular Grade unleaded gasoline Special Grade 91.0 RON unleaded gasoline was specified but was not available.

During this evaluation period, no detrimental effects were noted on material handling equipment (MHE), engineer support equipment, and commercial, tactical, or combat vehicles operated under typical daily military operation.

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FOREWORD

This report represents the final report to satisfy the contractual reporting requirements under Contract No. DAAD05-72-C-0427. The Army's "Laboratory & Field Study to Determine the Effects of Using Low-Lead/Unleaded Gasoline in Army Engines" program is being continued under Contract No. DAAD02-75-C-0082.

The authors wish to acknowledge the assistance provided by Mr. Raymond D. Townsend, Jr. who served as rater for the octane requirement determinations. Special acknowledgements are given to Mr. Edward B. Trescott for outstanding technical assistance in program planning, development, and coordination: and to Messrs. H.L. Ammlung, M.E. LePera, R.D. Quillian, Jr., and J.T. Gray for their encouragement, comments, and suggestions.

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I. INTRODUCTION

On February 4, 1970, the President of the United States issued Executive Order No. 11507 which stated in part that, "the Federal Government in the design, operation, and maintenance of its facilities shall provide leadership in the nationwide effort to protect and enhance the quality of our air and water resources." Also at that time, it was considered that the lead being emitted in automobile exhaust fumes was sufficiently harmful to humans and restrictive measures should be taken to eliminate the lead anti-knock compounds in gasoline. So, consequently, at a White House meeting on September 17, 1970, it was decided that the Federal Government would take the initiative in the use of low-lead and unleaded gasoline. This decision prompted the President to take the following actions:

- He requested that the administrator of General Services issue a regulation requiring Federally-owned vehicles to use low-lead and unleaded gasoline whenever practical and feasible.

- He urged the Governors of the 50 states to take similar action within the state governments in order to reduce air pollution and increase the market for low-lead and unleaded gasoline.

Since the US Army must maintain an effective force for combat readiness, the decision to use unleaded gasoline caused considerable concern, especially since low-lead and unleaded gasoline had not been used to any great extent and the potential effects on automotive engines and equipment was not known. Therefore, in mid 1971, the Army decided to conduct an unleaded gasoline evaluation program to determine the impact that unleaded gasoline would have on Army engines and equipment. This program was divided into a two phase effort:

Phase I – Laboratory Evaluation
Phase II – Field Study Evaluation

Phase I consisted of intensive engine dynamometer testing of six different spark ignition engine types currently operational in Army vehicles or as powerpacks for field generator sets. The engines were operated for 125 hr at wide open throttle and/or 100 percent load output at maximum torque. One engine of each type was operated on one of three test fuels. The test fuels used were:

- Military Specification MIL-G-46015 Gasoline, Automotive, Combat, Referee Grade, Amendment-1, Grade I — Conventionally Leaded

- Interim Federal Specification VV-G-001690 (Army-MR) Gasoline, Automotive Low-Lead or Unleaded, Special Grade — Low-Lead (0.5 g/gal max)

- Interim Federal Specification VV-G-001690 (Army-MR) Gasoline, Automotive, Low-Lead or Unleaded. Special Grade — Unleaded (0.07 g/gal max)

All six engine types performed satisfactorily on all gasoline blends and the results were reported in Phase I interim report (AD 766337) dated January 1973.

Phase II involved the complete conversion (both vehicles and equipment) of four Army installations to the sole use of Federal Specification VV-G-001690 unleaded gasoline.

The installations chosen for the field study evaluation, the program starting data, and the installation coordinators were as follows:

Installation	Starting Date	Coordinator
Dugway Proving Ground, UT	12-15-72	Capt. R.J. Verdoorn
Letterkenny Army Depot, PA	1-22-73	Mr. Fred Stambaugh/ Mr. O.L. Wenger
Fort Eustis, VA	3-30-73	Mr. Henry Powell/ Mr. Russell Moore
Fort Carson, CO	5-1-73	Maj. Guy A. Wilhelm

All vehicles and equipment at the above installations have been operating on unleaded gasoline for one year and at the direction of Department of the Army, these four installations will continue this operation for an additional year. Army Fuels and Lubricants Research Laboratory (AFLRL) personnel will continue to monitor the program under Contract DAAK02-75-C-0082. This extension was recommended by Army Materiel Command and approved by the Department of the Army to allow greater mileage accumulation on the tactical and combat vehicles and to study the long-range effect of unleaded gasoline on the commercial vehicle fleet.

II. APPROACH

- Select four Army installations having adequate distribution of administrative, tactical, and combat vehicles with high utilization rates.
- Complete conversion of selected installations to VV-G-001690 lead-free, Special Grade (91.0-92.5 RON) gasoline.
- Monitor fuel procurement, vehicle mileage, normal maintenance techniques, conduct inspections of fuel related problems, and monitor fuel economy.
- Define problem areas resulting in increased maintenance and/or operating costs.
- Determine engine octane requirement increase on vehicles operating solely on unleaded gasoline.

III. DISCUSSION

Four military installations (Dugway Proving Ground, Utah; Letterkenny Army Depot, Pennsylvania; Ft. Eustis, Virginia, and Ft. Carson, Colorado) were selected for the field study evaluation. These installations were chosen because of vehicle density, high vehicle utilization, and an adequate mix of both commercial and military vehicles. Also, they were selected for the differing climatic extremes which provided high and low altitude, and dry, humid, hot, and cold conditions.

The original desire was to have four installations that were supplied unleaded gasoline by different refiners, however, only American Oil Company (Amoco) was marketing unleaded gasoline in the areas of these installations, therefore Amoco became the sole supplier of unleaded gasoline for this phase of the program.

Prior to receiving unleaded gasoline, each of the participating installations was required to pump all gasoline storage tanks completely dry and let them air dry for at least two days in order to avoid contamination. Also, the vehicle fuel tanks were required to be below 1/4 full before they were charged with the unleaded fuel. In this way, the program was begun immediately on gasoline of less than 0.07 grams per gallon (g/gal) lead content, which was the maximum lead content allowable at the beginning of Phase II. Also, an octane quality of between 91.0 and 92.5 Research Octane Number, (Special Grade) corrected for altitude, was specified for this program. However, refiners in the areas of the four installations were marketing a slightly higher octane quality fuel, therefore, unleaded gasoline in the higher octane range was used throughout the program.

It should be noted that with the altitude correction factor, the unleaded gasoline used at Ft. Carson, Colorado was just slightly above the Special Grade limitations on octane quality. When the field evaluation was begun in December 1972, Federal Specification VV-G-001690 (Army-MR) allowed only a 3 octane number correction, however, when Federal Specification VV-G-001690A (Army-MR) became effective on 15 April 1974, it allowed a 4.5 octane number correction for altitude. Additional precautions were taken early in the program, such as, increased fuel sampling for analysis to determine the stability of the lead content below 0.07 g/gal. A program was established through General Material Petroleum Activity (GMPA) for the installations to collect unleaded fuel samples for analysis by both AFLRL and the respective GMPA Eastern and Western Petroleum Division offices (see Fuel Analyses, Page 11).

The only record required of the installations, other than keeping normal maintenance management records, was recording the mileage of each vehicle when initially serviced with unleaded gasoline. Also, since the majority of tactical vehicles and all combat vehicles were located at Ft. Carson, they were required to maintain separate fuel and mileage records on five control vehicles of each type used.

TABLE 1. NUMBER OF COMMERCIAL, TACTICAL, AND COMBAT VEHICLES AT EVALUATION SITES

Location	Approximate No. Vehicles		
	Commercial	Tactical	Combat
Dugway Proving Ground	312	0	0
Letterkenny Army Depot	480	0	0
Fort Carson	431	1,610	490
Fort Eustis	259	117	0
Total	1,482	1,727	490

A complete breakdown of all vehicles and equipment on the program at each installation is given in Appendix E. However, Table 1 indicates the *approximate* number of commercial, tactical, and combat vehicles used.

A. Typical Engine Failures

It was originally suspected that problems such as valve recession, pre-ignition, and harmful detonation which could cause problems in combat and tactical vehicle engines might be encountered, therefore, the program coordinator at each installation was asked to document and report any engine failure suspected of being fuel related. One problem encountered was valve guide failures in 1971 Ford 351 CID (Windsor) engines. Approximately 25 of these failures occurred at Dugway, Ft. Eustis, and Letterkenny (Ft. Carson had no vehicles with the Windsor engine) during the 12 month evaluation period. This represented approximately 50 percent of all vehicles equipped with the Windsor engine. However, it was determined that these failures were not associated with the use of unleaded gasoline. During the time of these failures, several visits were made to other AMC installations using normally leaded and low-lead gasoline. At installations where 1971 Ford vehicles with the Windsor 351 CID engines were used, the failure rate was also approximately 50 percent, regardless of fuel used. Also, a letter from Ford Motor Company to all Ford and Lincoln-Mercury Dealers advised them the warranty on 1971 Fords with the 351 Windsor engines was extended an additional 12 months or 12,000 miles.

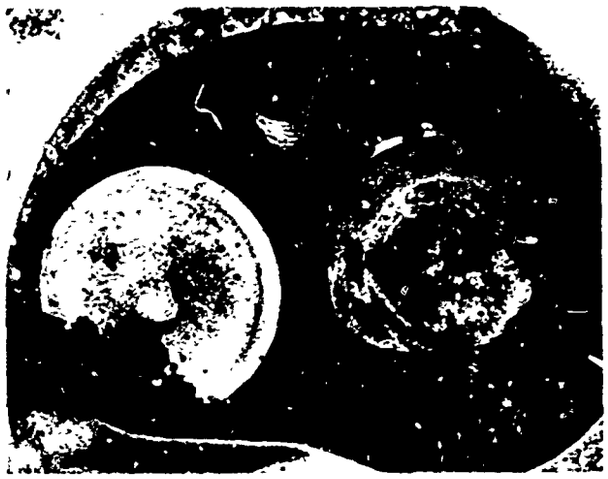
In the vehicle mix, there were numerous older model vehicles (1965 to present) and it was anticipated that engine timing adjustments might be necessary, particularly in the higher compression ratio engines. Throughout the 12 months' operation on unleaded gasoline, there was no evidence that timing changes or any engine adjustments, other than normal routine maintenance, were necessary to maintain satisfactory engine performance. Also, during this 12 month period, there were several other engine failures. Some of these were fuel related and did consist of burned exhaust valves, pre-ignition and detonation problems. However, there is no evidence to indicate that unleaded gasoline, per se, was responsible since the incident rate was very low (approxiamtely 12 failures in over 3600 vehicles) and since similar failures had occurred on normally leaded and low-lead gasoline at these installations prior to their conversion to unleaded gasoline.

Figure 1 shows the only valve recession problem encountered during this phase of the program. It occurred in a 1965 Ford pickup truck with a six cylinder, 240 CID engine that had in excess of 85,000 miles, with approximately 14,000 miles on unleaded gasoline. The exhaust valves showed varying degrees of recession. Since there are quite a few 1965 model vehicles in the program with similar mileages and no failures, again it is difficult to say that unleaded gasoline contributed to this failure.

The program coordinator at each installation had been asked to report all engine failures to AFLRL during this program so an inspection could be conducted to determine if the failure was related to the use of unleaded gasoline. Figures 2, 3, and 4 show the only tactical or combat vehicle failure that was originally suspected of being fuel-related. This was a Chrysler 75M engine powering a M-113 armored personnel carrier at Ft. Carson. The engine failed on 14 November 1973 after operating approximately 315 miles on unleaded gasoline. A detailed inspection of the engine by AFLRL and Ft. Carson personnel indicated the failure occurrence was due to cracked head gaskets. This condition allowed water to flow into the cylinders. Other leaks in the cooling system allowed the water level to get so low that inadequate cooling caused the engine to overheat and consequently fail.

Throughout the program, there were 1482 commercial vehicles which operated for 13,193,114 miles, 1727 tactical vehicles which operated for 6,473,535 miles, and 490 combat vehicles which operated for 424,872 miles on unleaded gasoline. Although there were several

Cylinder No. 1

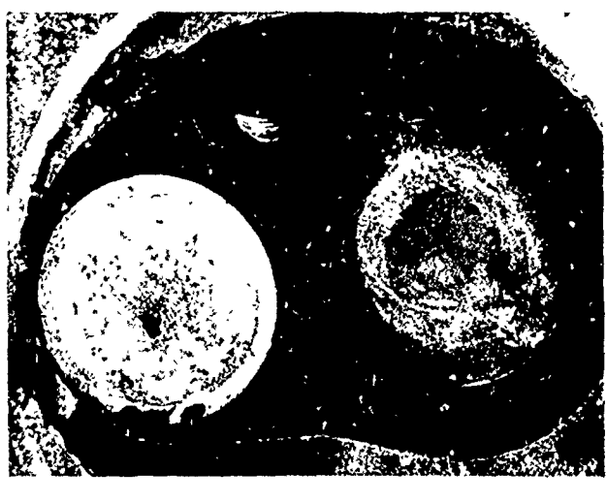


Cylinder No. 2

Cylinder No. 3

Cylinder No. 4

Cylinder No. 5



Cylinder No. 6

FIGURE 1. 1965 FORD 240 CID ENGINE SHOWING EXHAUST VALVE RECESSION

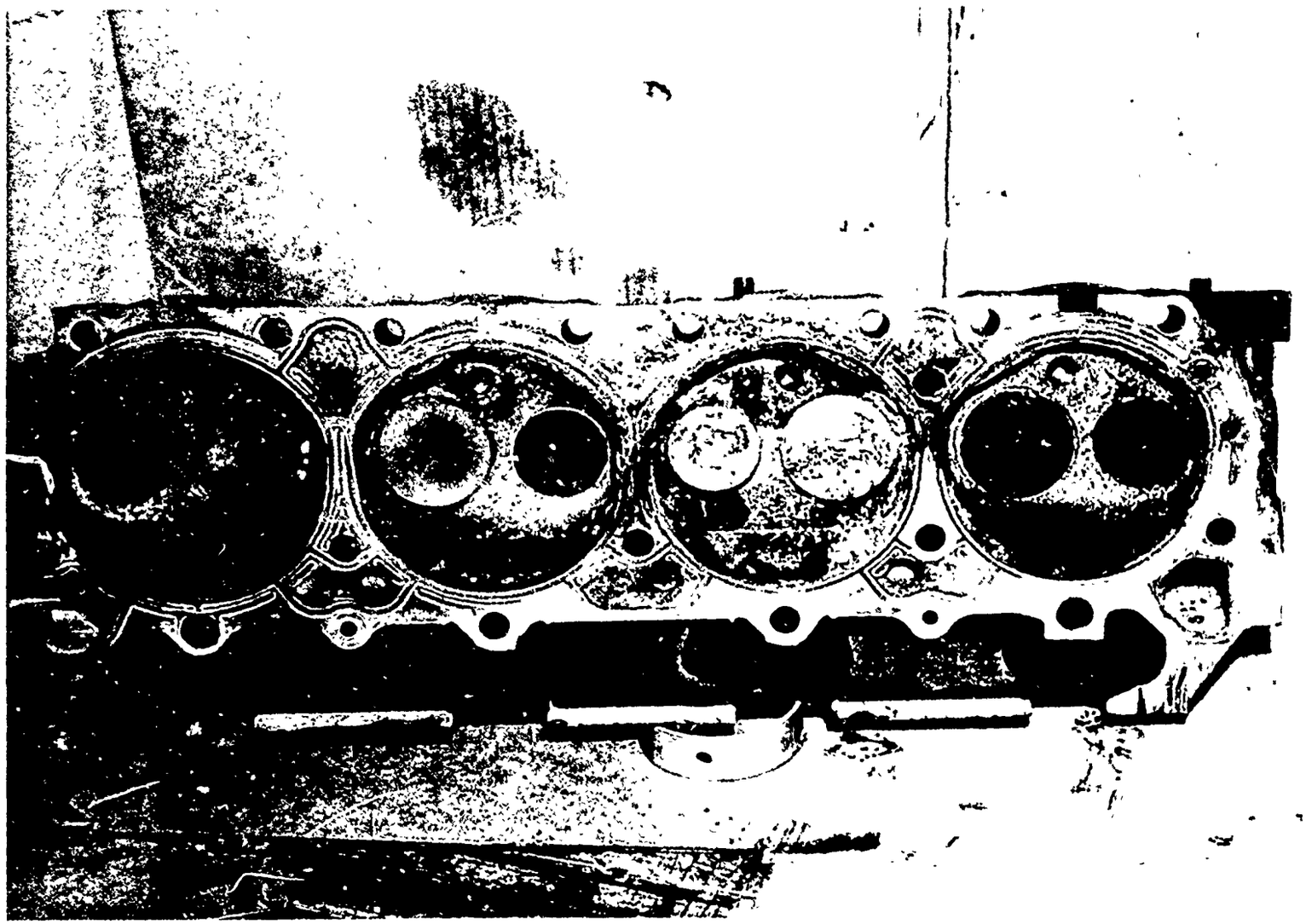


FIGURE 2. CHRYSLER 75M ENGINE, SN 23962, SHOWING METAL TRANSFER ON CYLINDER NO. 4 COMBUSTION SURFACE AND VALVES.

(NON-FUEL RELATED FAILURE)

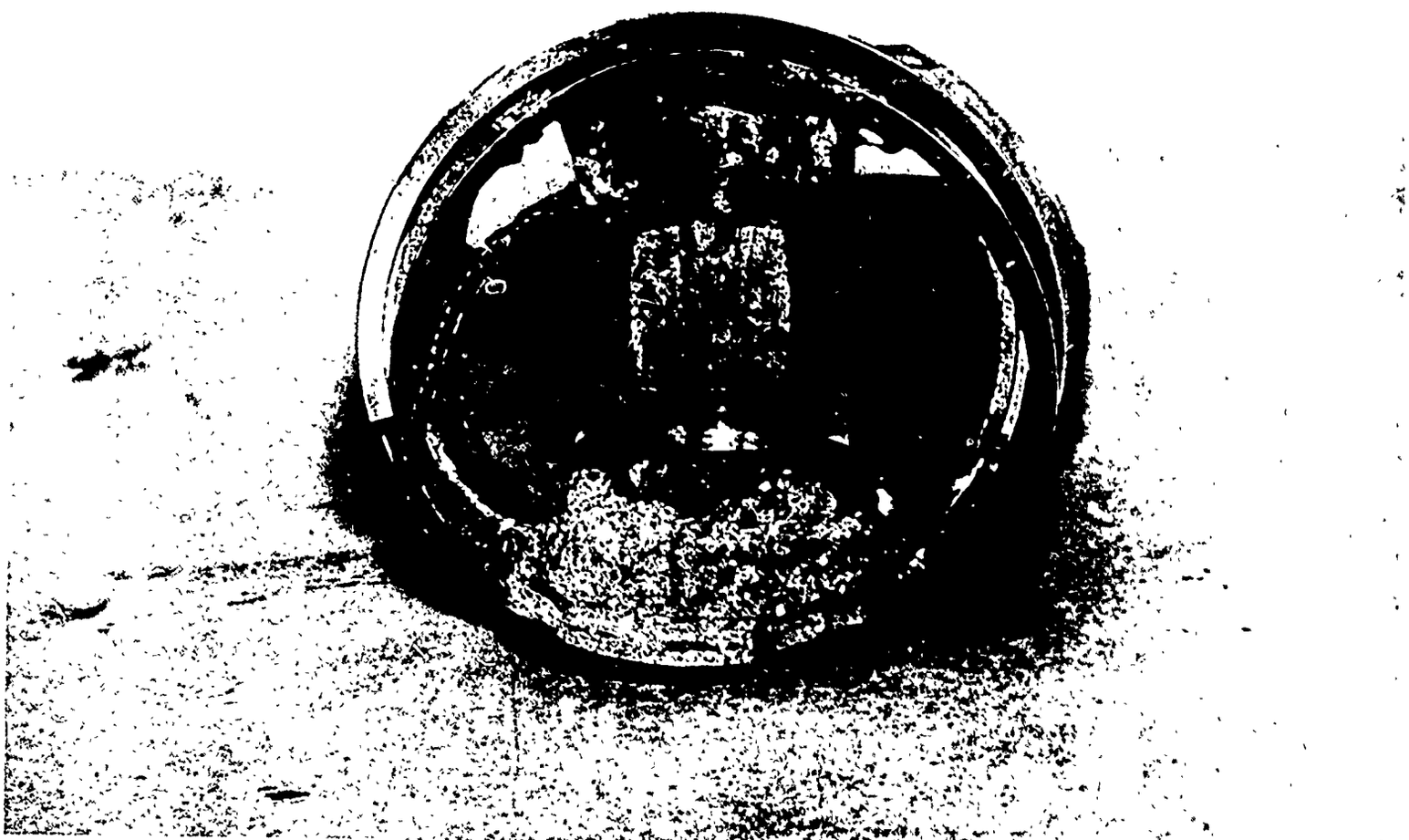


FIGURE 3. REMAINS OF TOP OF NO. 4 PISTON, CHRYSLER 75M ENGINE, SN 23962.

(NON-FUEL RELATED FAILURE)

FIGURE 4. CHRYSLER 75M ENGINE, SN 23962, SHOWING SEVERE SCORING AND METAL TRANSFER IN NO. 4 CYLINDER.

(NON-FUEL RELATED FAILURE)

failures at these evaluation sites during Phase II, not one of the four posts reported a failure that was directly attributable to the use of unleaded gasoline.

B. Fuel Economy

Fuel consumption and mileage records are generally not maintained by military installations in a manner where their information can be checked periodically, therefore it is difficult to predict accurately the fuel economy obtained on unleaded gasoline. From the data available, it does not appear there is any significant increase or decrease in economy with the use of unleaded gasoline. Table 2 shows fuel consumption on several vehicles at Dugway Proving Ground for six months prior to conversion to unleaded gasoline and also during the first six months on unleaded fuel. The overall average prior to conversion is 9.2 miles per gallon (mi/g) and after conversion to unleaded fuel, the average was 9.6 mi/g.

TABLE 2. FUEL CONSUMPTION COMPARISON AT DUGWAY PROVING GROUND

USA No.	Year	Make	Model	Fuel, mpg	
				Leaded (July–Dec, 1972)	Unleaded (Jan–June, 1973)
OIN73470	1970	Chev Carryall	4 X 4, 6 cyl	14.5	12.4
OIN73770	1970	Chev Carryall	4 X 4, 6 cyl	9.6	10.2
IN7389	1965	Ford F-250 Trk Crgo	3/4 ton, 4 X 4	15.0	13.8
IN7423	1965	Ford F-250 Trk Crgo	3/4 ton, 4 X 4	13.9	19.9
IN7422	1965	Ford F-250 Trk Crgo	3/4 ton, 4 X 4	10.6	8.3
IN7380	1965	Ford F-250 Trk Crgo	3/4 ton, 4 X 4	7.9	8.8
IN7416	1965	Ford F-250 Trk Crgo	3/4 ton, 4 X 4	8.9	11.6
OIS88770	1970	Dodge D-400 Trk, Van	4 ton	9.1	8.7
OIA43070	1970	Dodge D-400 Trk, Van	4 ton	8.4	7.8
IS1826	1967	Ford F-600 Trk, Stk	5 ton	8.9	8.6
OIB36867	1968	Ford F-600 Trk, Stk	5 ton	5.7	9.0
IN5916	1965	Ford F-759 Trk, Dump	6-1/2 ton	3.9	3.4
IN5909	1965	Ford F-759 Trk. Dump	6-1/2 ton	5.9	5.7
IN5959	1965	Ford F-759 Trk, Dump	6-1/2 ton	6.5	5.7

TABLE 3. FUEL CONSUMPTION ALL VEHICLES, ALL INSTALLATIONS

Installation	Vehicle Type	Miles Driven	Fuel Used, gal	Approx. Mpg
Dugway Proving Ground	Commercial	2,714,561	263,343	10.3
Ft. Carson	Commercial	3,802,260	*	–
	Tactical	6,178,335	*	–
	Combat	424,872	*	–
Letterkenny	Commercial	3,433,451	332,196	10.3
Ft. Eustis	Commercial	3,242,042	300,587	10.8
	Tactical	295,200	68,000	4.3

*Fuel consumption figures by groups not available. Total consumption during this period was 1,700,406 gal.

Although no comparison can be made for all vehicles in the field evaluation program, Table 3 shows the fuel consumption and miles per gallon for all vehicles for one year on unleaded gasoline.

Also, fuel consumption and mileage records were maintained on certain control vehicles at Ft. Carson and Dugway Proving Ground throughout the evaluation. Tables 4 and 5 show the fuel economy on these vehicles. Again, these figures do not

reflect any major increases or decrease in fuel economy from use of unleaded gasoline.

C. Fuel Analyses

Fuel properties were monitored by the GMPA Eastern and Western Petroleum Offices and AFLRL. Samples of periodic bulk gasoline shipments received by the four evaluation sites were forwarded to the Petroleum Field Offices and AFLRL for analyses. Complete routine analyses were conducted by the Petroleum Field Offices to insure that the gasoline samples were within specification limits. At AFLRL, particular emphasis was given to analyzing the samples by the following methods:

- Lead content by atomic absorption.
- Research and motor octane numbers.
- Hydrocarbon type composition by ASTM D-1318, fluorescent indicator adsorption (FIA).
- Oxidation stability by ASTM D-525.

TABLE 4. FUEL ECONOMY ON SELECTED VEHICLES AT FT. CARSON, COLORADO

Type Vehicle	Lowest Mileage	Highest Mileage	Avg Miles Unleaded Gas	Avg Mpg
5 each 1/2 ton M151	6,681	14,004	5,425	9.6
5 each 1-1/4 ton M715	11,268	23,477	1,800	7.3
5 each C/R veh M114	957	2,742	317	3.6
5 each VTR M88	1,848	4,547	860	0.2
5 each APC M113	502	7,693	780	2.3
5 each 5 ton TRK M54/M543*	1,731	33,993	2,125	3.4

*Replaced with diesel equipment in February 1974, dropped from control roster.

TABLE 5. FUEL ECONOMY ON SELECTED VEHICLES AT DUGWAY PROVING GROUND

Vehicle No. U.S.A.	Year	Make	Model	Miles On Unleaded Gasoline*	Approx. Mpg*
CA 1477	1972	Ford	Custom Sedan	5,581	14.2
01F63471	1971	Ford	Custom Sedan	18,901	18.8
01F64471	1971	Ford	Custom Sedan	8,791	21.5
CA 2522	1972	AMC	Matador Sedan	13,940	17.7
01F63671	1971	Ford	Custom Sedan	23,789	11.7
01K02070	1970	Ford	F-100 1/2-ton pickup	31,329	12.1
01D92072	1972	Chevy	C-10 1/2-ton pickup	7,459	14.6
01C07171	1971	Dodge	D-100 1/2-ton pickup	36,257	10.6
CA 4475	1972	Chevy	C-10 1/2-ton pickup	51,050	11.6
1N1666	1965	Ford	F-100 1/2-ton pickup	9,003	9.0
01M09570	1970	IHC	Scout 800A	2,942	12.6
01N44970	1970	Chevy	Carryall GE-21006	12,394	15.0
01N72970	1970	Chevy	Carryall KS-10906	7,977	13.4
01C37168	1967	Ford	Truck-Tractor F-750	9,716	5.5
01C77370	1969	IHC	8-1/2 ton dump, 1890	5,153	8.5
1N7255	1965	IHC	Wrecker, F-1700	3,171	5.6
01S24168	1968	IHC	1-1/2 ton Stake, 13000	4,654	9.8

*Mileage and fuel consumption figures are January, 1973 through December, 1973.

Table 6 shows the minimum, maximum, and average fuel analyses for each installation as determined by AFLRL. Through 30 June 1974, only unleaded gasoline of extremely low-lead content had been received at each of the four installations. This was remarkable considering the major fluctuations in CONUS gasoline supply availability during 1973 and 1974.

The gasoline supplied to Ft. Carson had the most consistent properties. Low olefin content, outstanding oxidation stability, and an average RON of 88.7 characterized the Ft. Carson gasoline. It should be noted that at the altitude of both Ft. Carson and Dugway, refiners were allowed to apply the maximum altitude correction and reduce the RON of unleaded gasoline by 4.5 numbers. This correction is allowed because vehicle octane requirements decrease as altitude increases. Thus, the 88.7 RON gasoline at Ft. Carson is roughly equivalent to at least a 93.2 RON gasoline at sea level. Applying the same altitude correction to the Dugway gasoline, the 92.1 RON average at Dugway is equivalent to a 96.6 RON gasoline at sea level. Considering the

TABLE 6. FUEL PROPERTIES SUMMARY (1/73 to 7/74)

Property	Ft. Carson	Dugway	Ft. Eustis	Letterkenny
Lead, g/gal				
min	0.003	0.001	0.001	0.002
max	0.023	0.006	0.040	0.026
avg	0.007	0.002	0.005	0.013
Research ON				
min	87.5	90.2	94.3	93.1
max	90.0	95.2	97.8	100.4
avg	88.7	92.1	95.4	94.7
Motor ON				
min	81.0	80.5	83.1	81.7
max	83.8	85.2	86.4	91.9
avg	82.2	83.0	84.4	83.8
Avg (R+M) /2	85.5	87.6	89.9	89.3
FIA				
v% Aromatics				
min	21	10	22	12
max	26	26	44	43
avg	23	16	30	27
v% Olefins				
min	3	9	12	13
max	8	27	38	41
avg	5	21	24	26
Oxidation Stability, minutes				
min	>1440	225	440	345
max	>1440	520	>1440	>1440
avg	>1440	425	645	610

altitude of Ft. Carson and Dugway, the fuel supplied had a higher octane quality than requested.

The gasolines supplied to Ft. Eustis and Letterkenny had a wide variation in properties, especially aromatic and olefin content. Ft. Eustis and Letterkenny gasolines had rather high average olefin contents, although no problems were encountered due to this fluctuation. Both Ft. Eustis and Letterkenny consistently received gasolines with higher octane quality than specified. The average RON was 95.4 at Ft. Eustis and 94.7 at Letterkenny Army Depot.

Detailed analyses of the aromatic content of unleaded gasolines from the four installations were determined using a gas chromatographic technique developed by AFLRL. Table 7 shows that the aromatic compositions of unleaded gasolines from the four installations were similar to the aromatic compositions of unleaded gasolines sampled during 1972 in a CONUS gasoline survey.

TABLE 7. AROMATICS ANALYSIS OF UNLEADED GASOLINES BY AFLRL

Installation	Typical 91 RON Unleaded*			Ft. Carson		Ft. Eustis	Letterkenny			Dugway			
Source or Sample No.	CONUS Survey			VII Inf. TNKR	TRK-186	7021-74E-1	Delv. Trk	7030-L-74-1	7706-L-74-1	Delv. Trk	pmp #1	PIF TRL #11-2114	PIF TRL #11-4255
Date	1972			3-73	6-25-73	8-29-73	1-73	8-1-73	8-29-73	1-73	2-73	7-16-73	7-73
Total Aromatics %	Max	Min	Avg										
By GC	39.3	8.4	28.9	25.3	22.4	28 7	26.5	27.4	19.8	15.6	11.7	15.4	15.7
By FIA	39	10	27	23	21	29	26	28	20	17	12	16	15
% Vol By GC													
Benzene	1.7	0.3	0.9	0.4	0.4	1.2	0.4	1.1	0.6	0.4	0.3	0.3	0.5
Toluene	15.9	2.0	6.8	2.6	3.4	7.3	3.4	5.7	3.9	2.0	1.4	1.9	2.0
Ethyl Benzene	2.7	0.4	1.5	1.2	1.1	1.3	1.3	1.2	0.9	0.7	0.4	0.6	0.7
m + p Xylene	10.5	1.8	5.2	4.0	3.6	4.7	4.8	4.7	3.5	2.8	1.9	2.3	2.2
o-Xylene	7.9	0.6	2.2	1.5	1.4	1.8	1.9	1.7	1.3	1.0	0.7	0.9	0.9
C_{9+} Aromatics	18.6	1.7	13.2	15.6	12.6	12.4	14.7	12.8	9.6	8.7	7.0	9.4	9.4

*From "Status of Unleaded and Low-Leaded Gasoline Composition by J.N. Bowden, AFLRL, August 1972.

IV. OCTANE REQUIREMENTS

A. Reference Fuels

Two series of reference fuels were used in making both the 1973 and 1974 octane requirement determinations. Primary reference fuels (PRF) were blended from ASTM grade isooctane (2, 2, 4-trimethylpentane) and normal heptane; both were obtained from Phillips Petroleum Company. By definition, isooctane is 100 octane number and normal heptane is zero octane number. Simple volume percent blends were made to obtain the desired octane number (for example, 80 percent vol isooctane and 20 percent vol normal heptane gives an 80 octane number blend). Primary Reference Fuels were blended between 64 and 100 octane number, generally in even number increments.

The other series of reference fuels used were the unleaded high sensitivity full boiling range fuels (FBRSU). These fuels were prepared from the following three base blends which were obtained from the Phillips Petroleum Company, Special Products Division:

RMFD-263-73
RMFD-264-73
RMFD-265-73

TABLE 8. COMPOSITION OF 1973 CRC-RMFD MOTOR FUELS VOLUME PERCENT

Blendstocks	263	264	265
Cat Cracked Gasoline	22.4	38.9	11.2
Light Platformate	1.8		4.1
70% Cyclopentane	23.3	7.7	13.7
98% Cyclohexane	10.7	-	
Soltrol 50		-	4.9
DIP Light Alkylate	-	6.9	
RF DIB	2.7	-	7.5
Com. n-Butane	2.2	4.1	2.8
RF n-Heptane	17.2		
Mixed Xylenes	6.0	-	14.8
Heavy Platformate		21.0	13.0
Com. Isopentane	2.7	6.9	
HF Light Alkylate		6.3	2.0
RF Isooctane			22.7
C_7 Aromatics	8.1		
Cyclohexane	2.9	-	
Com n-Heptane		8.2	
RF Benzene			3.3

TABLE 9. PROPERTIES OF 1973 CRC-RMFD MOTOR FUELS

Property		263	264	265
Distillation, F*				
IBP		107	97	103
10% evap.		143	129	142
30% evap.		167	169	182
50% evap.		195	205	215
70% evap.		230	233	239
90% evap.		310	295	285
EP		410	406	351
API Gravity, deg		57.2	58.0	55.9
RVP, lb		7.1	7.8	7.1
Oxidation stability, min		1440+	1440+	1440+
Lead, g/gal	Spec	<0.05	<0.05	<0.05
	Results	0.0004	0.0023	0.0003
Aromatics	Spec	17 ± 7	30 ± 7	40 ± 7
	Results	21.7	27.9	33.4
Olefins	Spec	10 ± 5	10 ± 5	10 ± 5
	Results	15.0	14.8	7.1
Saturates		63.3	57.3	59.5
RON				
	Spec	83.5 ± 1	91 ± 1	101 ± 1
	Results†	84.4	91.6	100.0
MON	Results†	76.5	81.7	87.9
Sensitivity (R-M)	Spec	8 ± 0.5	10 ± 0.5	12 ± 0.5
	Results	7.9	9.9	12.1

*Reported by fuel supplier.
†Average of ratings reported by 10 laboratories participating in 1973 octane requirement survey.

The composition of the three base fuel blends is shown in Table 8. Table 9 shows the physical property inspections of the base fuels. FBRSU fuels were blended from 84 to 100 research octane number, generally in even number increments. Table 10 shows the blending composition

TABLE 10. 1973 UNLEADED HIGH SENSITIVITY FULL-BOILING RANGE REFERENCE FUEL SERIES (FBRSU)

Research No.	Blending Data Composition Percent			Motor Octane No.*	(R + M)* / 2
	RMFD-263-73	RMFD-264-73	RMFD-265-73		
84 (84 b)	100	-		76.5	80.6
85	85	15		77.0	81.0
86	69	31	-	77.7	81.9
87	56	44		78.4	82.7
88	44	56		79.1	83.6
89	31	69		79.8	84.4
90	19	81		80.5	85 3
91	7	93	-	81.3	86.2
92	-	95	5	82.0	87.0
93	-	83	17	82.7	87.9
94		71	29	83.5	88.8
95		61	39	84.2	89.6
96	-	50	50	84.9	90.5
97	-	39	61	85.6	91.3
98		27	73	86.3	92.2
99	-	14	86	87.1	93.1
100	-	-	100	87.9	94.0

*Average ratings reported by 10 laboratories participating in 1973 CRC octane requirement survey.

data which were determined from the average ratings reported by the ten laboratories participating in the 1973 CRC octane requirement survey. For the 1973 AFLRL octane requirement work, 84 RON was the lowest FBRSU fuel used. In making the 1974 octane requirement determinations, calculated amounts of normal heptane were added to RMFD-263-73 to obtain FBRSU fuels below 84 RON. The lowest octane number FBRSU fuel blended was 62 RON which contained 26.8 percent vol normal heptane added to RMFD-263-73.

B. Results of Determination

To determine if prior predictions that vehicles operating solely on unleaded gasoline for prolonged periods of time would experience a high-octane requirement increase, octane requirements were obtained on commercial and tactical vehicles at Ft. Carson, Colorado and Ft. Eustis, Virginia. Approximately 15 vehicles at each of these installations were evaluated shortly after the initiation of the program and again after approximately 12 months' operation on unleaded gasoline.

TABLE 11. HIGH, LOW, AND AVERAGE MILEAGE ON VEHICLES AT FT. CARSON AND FT. EUSTIS PRIOR TO BEGINNING OCTANE DETERMINATION

Total Mileage	Ft. Carson, Co.		Ft. Eustis, Va.	
	Initial Determination	After 12 Months	Initial Determination	After 12 Months
High	63,332	64,668	66,711	78,380
Low	10,995	12,676	910	3,036
Average	31,645	34,550	23,295	30,310
On unleaded gasoline (avg)	1,155	5,585	*	5,860

*Mileage & date stickers placed on vehicle windshields at beginning of program had been lost or removed prior to octane determination.

All of these vehicles had previously operated on normally leaded gasoline prior to the installations conversion to unleaded gasoline. Table 11 shows the high, low, and average mileage on the vehicles prior to beginning the unleaded program as well as the miles operated on unleaded gasoline prior

to the first determination and also the mileage accumulated on unleaded gasoline during 12 months operation.

The vehicles at Ft. Eustis, Virginia, averaged about a 3.9 number increase in engine octane requirement on Primary Reference Fuel and 2.1 increase using Full-Boiling Range Sensitive Unleaded Reference fuels. The lowest octane available in the FBRSU Reference Fuel in 1973 was 84.4, therefore since some vehicles were below this value, it was impossible to establish any change for those vehicles. Also, there was no difference in octane requirement of the engine whether the vehicles were empty or loaded to maximum gross weight.

In 1973, Full-Boiling Range Sensitive Unleaded Reference Fuels in the octane range needed for the altitude of Ft. Carson, Colorado were not available, therefore in the initial octane requirement evaluation at Ft. Carson, only Primary Reference Fuels were used. However, the FBRSU reference fuels were blended for the 1974 evaluation and a comparsion will be made at the end of the second year's operation on unleaded gasoline. Although some vehicles experienced a decrease in engine octane requirement, the overall average increase for all vehicles operated at Ft. Carson averaged 4.1. Also, as at Ft. Eustis, the 1974 evaluation showed there was no significant difference whether the vehicle was empty or loaded to maximum gross weight.

Tables 12 and 13 show the overall result of the octane determinations. However, at the present time, it is still not known how great an octane requirement increase can be expected in vehicles operating solely on unleaded gasoline for a prolonged period of time. These same vehicles at Ft. Eustis and Ft. Carson will be evaluated again at the end of the second year's operation on unleaded gasoline. This evaluation should provide adequate information to determine if, after sufficient time and mileage on unleaded gasoline, a plateau will be reached on octane requirement increase.

Also, Table 12 reflects the evaluation of one vehicle (1974 Chev 1/2-ton pickup No. G-162) which was received new at Ft. Carson after the lead-free gasoline program was begun and had been operated only on unleaded gasoline. Therefore, when this vehicle is evaluated again at the end of the second year, it should provide information on whether "clean" engines experience the same octane requirement increase on unleaded gasoline as those which previously operated on low-lead or conventionally leaded gasoline.

It has been reported (*Oil and Gas Journal*, December 2, 1974, p. 48) that a large percentage of 1975 model vehicles will require unleaded gasoline higher than 91.0 RON. This report further states that significant knocking may occur on approximately 33 percent of new 1975 automobiles when initially purchased and may increase from 55 to 60 percent after a few thousand miles. It is further reported that the increase may be from 3 to 5 octane numbers. This is an area of utmost concern to the Department of Army since VV-G-001690A permits procurement of 91.0 RON minimum unleaded gasoline for commercial and administrative vehicles equipped with the lower compression ratio spark-ignition engines designed to operate on a reduced anti-knock quality gasoline. The vehicles include pre-1971, 1971, and post-1971 models. Therefore, the extention of this program for an additional twelve months will allow AFLRL to monitor the octane requirement increase on vehicles presently on the lead-free gasoline program and establish baseline data on 1975 models entering the Army's inventory.

The test courses, instrumentation, and typical vehicles used in the octane requirement determination at Ft. Carson and Ft. Eustis are shown in Figures 5 and 6.

TABLE 12. ROAD OCTANE EVALUATIONS, FT. CARSON, COLORADO
UNLEAD GASOLINE IMPACT PROGRAM

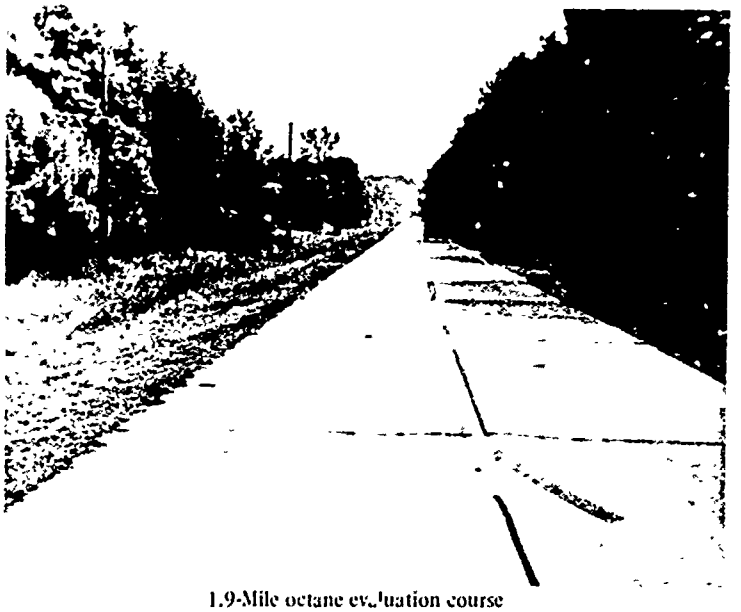
Make & Model	No. Cyl	Type Transmission	Type Carburetor	Number		Mileage		PRF RON Requirement				RON Requirement Max Gross Wt (Except Sedans) FBRSU (1974)
				Bumper	USA	Total	Since 1973 Eval.	Vehicle Unloaded 1973	Vehicle Unloaded 1974	Inc/Dec	Vehicle Max Gross Wt (1974)	
M 151 Jeep	4	3-speed std.	1 BBL		02V68369	34,798	7,734	80	85	+5	85	83
M 151 Jeep	4	3-speed std.	1 BBL	-	2R4617	36,858	4,709	72	79	+7	79	77
M 151 Jeep	4	3-speed std.	1 BBL	-	2N8341	27,921	1,994	80.5	77	-3.5	NA	NA
M 715 1¼ ton	6	4-speed std.	1 BBL	-	3F8387	23,027	1,035	68	85	+17	87	85
M 715 1¼ ton	6	4-speed std.	1 BBL		3F8305	12,676	1,295	70	65	-5	67	67
M 715 1¼ ton	6	4-speed std.	1 BBL	-	3F8490	14,911	1,804	86	87	+1	89	89
1969 Ambassador Sedan	6	3-speed std.	1 BBl	A--019	01C39669	49,995	5,181	80	81	+1	NA	81
1972 Ford Custom Sedan	8	Automatic	2 BBL	A--089	CA0924	26,079	15,084	82	87	+5	NA	97
1968 Ford Fairlane Sedan	6	Automatic	1 BBL	A 008	OIL74468	*	*	88	NA	NA	NA	NA
1968 Chev. ½-ton pickup	6	3-speed std.	1 BBL	G -092	0IJ94468	64,668	9,324	68	77	+9	77	77
1964 Dodge ½-ton pickup	6	3-speed std.	1 BBL	G 030	IL7393	64,162	5,649	84	89	+5	89	95
1972 Chev. ½-ton pickup	8	Turbo-hyd.	4 BBL	G - 005	01D83272	22,737	7,623	78	81	+3	81	77
1974 Chev. ½-ton pickup	8	Turbo-hyd.	2 BBL	G 162	CB8693	1,249	-	-	NA	NA	69	<62
1973 Chevelle Sedan	8	Turbo-hyd.	2 BBL	A-120	CB-0834	16,199	-	-	67	NA	NA	<62
M 151 Jeep	4	3-speed std.	1 BBL	-	2K3659	16,423	-	-	NA	NA	77	73

*Dropped from inventory.

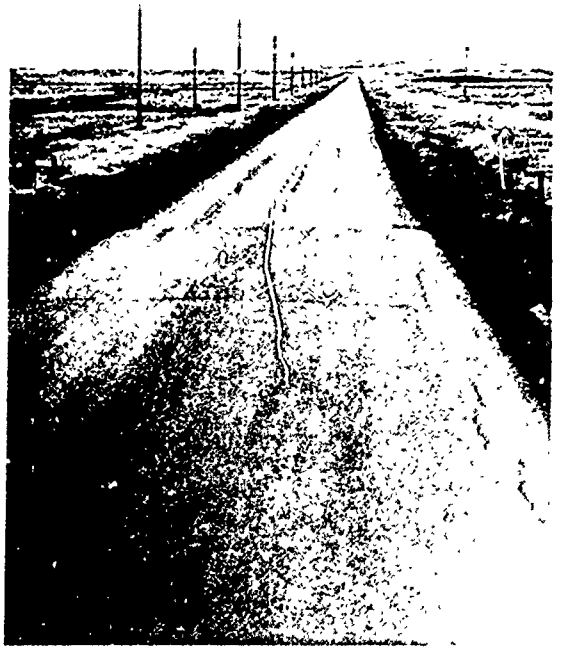
TABLE 13. ROAD OCTANE EVALUATION, FT. EUSTIS, VA.
UNLEAD GASOLINE IMPACT PROGRAM

Make & Model	No. Cyl.	Type Transmission	Type Carb.	Number		Mileage		PRF RON Requirements			Max Gross Wt (1974)	FBRSU RON Requirements			Max Gross Wt (1974)
								Vehicle Unloaded		Inc/ Dec		Vehicle Unloaded		Inc/ Dec	
				Bumper	USA	Total	Since 1973 Eval.	1973	1974			1973	1974		
Dodge 3/4-ton M-37	6	Std. 4 Speed	1 bbl	HQ 10	3B6663	12,689	2,472	74*	79*	+5	79	†	85	–	85
Dodge 3/4-ton M-37	6	Std. 4 Speed	1 bbl	HHC 17	3D9000	4,234	2,526	75	77	+2	77	85	87	+2	87
Dodge 3/4-ton M-37	6	Std. 4 Speed	1 bbl	HHC 15	3C2299	3,036	2,126	75	81	+6	81	†	85	–	85
Jeep 1-1/4-ton M-715	6	Std. 4 Speed	1 bbl	100T 5	3G3224	–	–	60	–	–	–	†	–	–	–
Jeep 1-1/4-ton M-715	6	Std. 4 Speed	1 bbl	508T 10	3F6617	–	–	78*	–	–	–	†	–	–	–
Jeep 1-1/4-ton M-715	6	Std. 4 Speed	1 bbl	HQ 13	[illegible]19	11,648	4,845	86*	87*	+1	89	87*	91*	+4	91
Kaiser Jeep 1/4-ton M-151	4	Std. 3 Speed	1 bbl	508T 26	F4071	32,108	7,006	81	91	+10	91	†	89	–	89
Ford Jeep 1/4-ton M-151	4	Std. 3 Speed	1 bbl	90TTP6	02MV3571	21,387	5,104	87*	89*	+2	89	90‡	91	+1	91
Ford Jeep 1/4-ton M-151	4	Std. 3 Speed	1 bbl	508T214	2N8708	30,452	6,297	86*	91*	+5	91	86‡	89	+3	89
1969 Ambassador Sedan	6	Std. 3 Speed	1 bbl	TMP A30	01B17069	65,662	4,709	86‡	87*	+1	NA	90‡	89*	–1	NA
1973 Chevelle Sedan	8	Turbo-Hydra	2 bbl	TMP A34	CB1543	15,865	13,396	81	81	0	NA	†	83	–	NA
1970 Ford Falcon Sedan**	6	Automatic	1 bbl	TMP A21	01G35370	78,380	11,669	86†	87†	+1	NA	91‡	89‡	–2	NA
1966 Chev. 1/2-ton pickup	6	Std. 3 Speed	1 bbl	TMP 241	1P7721	55,853	6,253	88	95	+7	95	87	95	+8	95
1972 Chev. 1/2-ton pickup	8	Turbo-Hydra	4 bbl	G208	01D56572	17,155	5,360	76	85*	+9	85*	†	87b	–	87
1970 Ford 1/2-ton pickup	6	Automatic	1 bbl	TMP 231	01J67970	45,557	4,401	83	85	+2	85	†	87	–	87

*Maximum requirement same for part and full throttle.
†Below 84.4 RON.
‡At part throttle maximum requirement.
**Vehicle had valves reworked at 68984 miles.



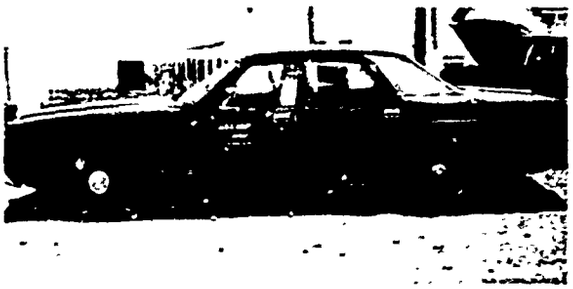
1.9-Mile octane evaluation course
(Ft. Eustis, Virginia)



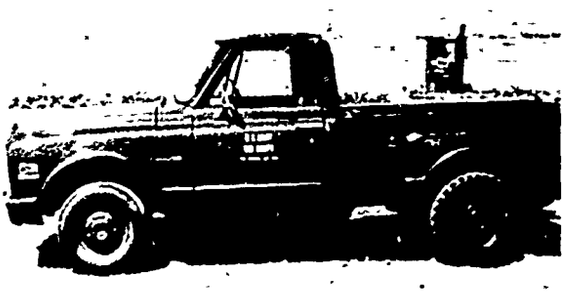
2.3-Mile octane evaluation course
(Ft. Carson, Colorado)

Typical instrumentation including
tachometer and vacuum guage

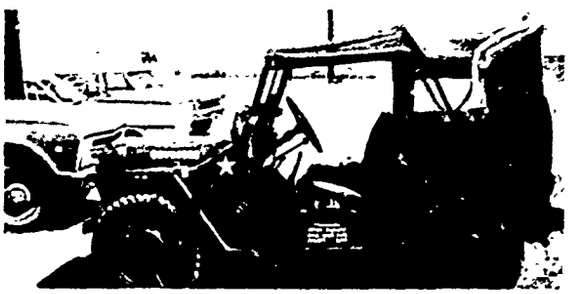
FIGURE 5. OCTANE EVALUATION COURSES AND INSTRUMENTATION



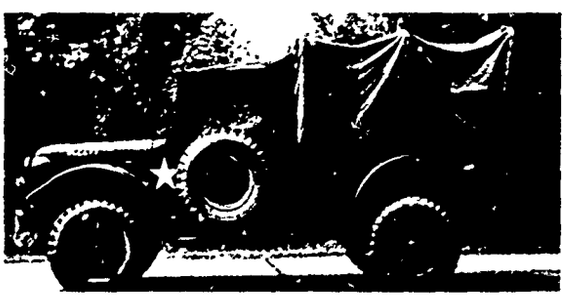
Sedan



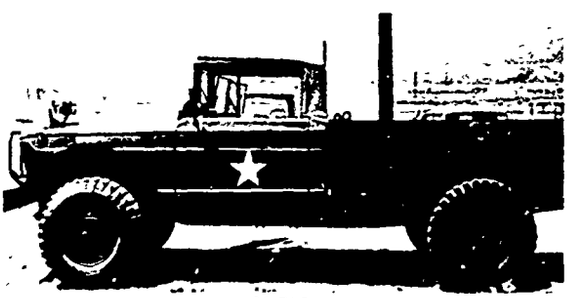
1/2-ton Pickup



M-151 Jeep



M-37



M-715

FIGURE 6. TYPICAL VEHICLES USED IN OCTANE DETERMINATIONS AT FT. CARSON, CO AND FT. EUSTIS, VA

V. CONCLUSIONS

The first year's operation on unleaded gasoline has been completed with more than 20,000,000 vehicle miles and many hours accumulated on Material Handling Equipment and other ground power equipment. It can generally be concluded that Phase II has proven that Army gasoline powered equipment and vehicles can be operated during their normal daily activities on unleaded gasoline in the octane quality range used in the program for long periods of time without any apparent fuel economy penalties and with no increase in maintenance or operating costs.

During Phase II there were no engine failures that could be attributed to the unleaded gasoline. there was no evidence of engine performance degradation, in fact, there were driver reports of better engine performance on the unleaded fuel. This is not at all surprising since cleaner burning engines had been observed during Phase I and longer life was obtained from spark plugs during the field evaluation.

At the completion of the first year's operation on unleaded gasoline in the field study program, the Department of the Army accepted Hq. AMC's recommendation to continue the program for an additional 12 months and to expand the program to other installations with a high density of tactical and combat vehicles. This decision was made to allow the tactical and combat vehicles (which had less than 4000 and 900 miles, respectively) to accumulate greater experience on unleaded gasoline and also to study the long range effects on engine performance of the commercial fleet.

Based on the results of Phase II, the Department of the Army has approved the conversion to unleaded gasoline CONUS wide, and recommendations for the following program are being considered by the Department of the Army to be instituted CONUS wide:

- All camps, posts, and stations should convert to the use of unleaded gasoline, Federal Specification VV-G-001690A, as soon as possible or feasible.

- The conversion program should be based on availability of unleaded gasoline presently dependent on refinery stock allocation to the government and reinstatement of gasoline procurement by specifications.

- If refinery stocks are unavilable for immediate CONUS wide conversion, priority requests for conversion to unleaded gasoline should be given to camps, posts, and stations where 1975 vehicles with catalytic mufflers will be procured.

The final reports from the four participating installations as submitted to AFLRL (without enclosures) are included as Appendices A, B, C, and D.

APPENDIX A

FINAL REPORT

Dugway Proving Ground, Utah

FIRST YEAR REPORT

December 1972 to January 1974

UNLEADED GASOLINE EVALUATION PROGRAM

Conducted At

DUGWAY PROVING GROUND
Dugway, Utah 84022

Prepared By

CPT RONALD J. VERDOORN
Chief, Equip Pool Br
Dugway Proving Ground
Dugway, Utah 84022

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I - INTRODUCTION

In 1970, Executive Order 11507 directed that all branches of the Federal Government provide leadership in all pollution-abatement activities. One facet of the overall pollution-abatement effort involved utilization of lead-free gasolines for compatibility with forthcoming catalytic emissions control systems. In conjunction with the automotive and petroleum industries research to provide less polluting automobiles and fuels, the Environmental Protection Agency in early 1972 published proposed regulatory schedules for the attenuation and control of lead antiknock compounds. One of the provisions of this schedule was for the "general availability" of a lead-free grade of gasoline by mid-1975.

With these factors in mind, the Army is constrained to rigorously investigate the impact of selective or total utilization of unleaded gasoline upon the efficiency of its surface vehicle fleet. Significant impairments to mission and/or increase in support maintenance costs must be identified, and the causes and solutions defined.

A program was initiated by the Army Material Command in Mid-1971. This study included a short-term laboratory engine test (Phase I) and a field evaluation program (Phase II) of which Dugway Proving Ground is a part. A contract to conduct the evaluation was assigned to U.S. Army Fuels and Lubricants Research Laboratory, San Antonio, Texas in June 1972.

This report covers findings and results of the first year's operation of vehicle and equipment at Dugway Proving Ground.

II - BACKGROUND

On 12 October 1972, an initial meeting was held at Headquarters, Deseret Test Center to discuss DTC's possible participation in the Phase II field evaluation program.

The meeting was attended by the following Representatives:

Mr. John Blakely, Headquarters AMC

Mr. John Tosh, USAFLRL

Mr. Gillette, DTC Procurement Division

Dr. Bagely, DTC P&S

Mr. S. McAllister, DTC Comptroller Division

LTC Ledbetter, DTC - PCO

CPT Verdoorn, DTC Logistics Directorate

As a result of this initial meeting, it was decided that Dugway Proving Ground, then known as Deseret Test Center, would participate in the fuel evaluation program under the guidance and direction of the U.S. Army Fuels and Lubricant Research Laboratory (USAFLRL).

III - OBJECTIVES OF EVALUATION

Define problem areas that would result in increased maintenance and operating costs.

Define fuel problems resulting in decreased engine performance (horsepower, fuel consumption, internal engine deposits, increased wear, etc).

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IV - PRE-PROGRAM ACTIONS

The current contract for Low-Lead gasoline was changed to Unleaded gasoline. This fuel met Federal Specification VV-G-001690, with a maximum lead content of less than .07 grams per gallon.

Prior to delivery of the first tank of unleaded gasoline, the storage tanks were drained and dried. The amount of storage capacity available did not allow for the 2 day drying period that was suggested in the evaluation plan but was felt adequate due to the already low lead content of prior fuel being used.

All dispensing facilities were identified as containing unleaded gasoline and all personnel involved in refueling operations were briefed and made aware of the importance of avoiding contamination of the test fuel with leaded gasoline (until both refueling locations were converted) also, any vehicle purchasing gasoline at an off post facility would make a maximum effort to purchase unleaded gasoline.

V - VEHICLE AND EQUIPMENT UTILIZATION

A post wide conception was employed for the evaluation program. All vehicles with exception of ambulances, and fire fighting equipment are fueled with unleaded gasoline. All generators, engineer equipment, lawn mowers, etc. were also converted to unleaded gasoline. After the first six months on the program, and no fuel related problems, the emergency vehicles were also put on the unleaded gasoline. On first fueling, the unleaded

gasoline, drivers were encouraged to have fuel tank level as low as possible. All vehicles fueled were marked with an identifying sticker, giving starting date and starting mileage.

VI - EVALUATION CONCLUSIONS

The first year of operations on the Unleaded Fuel Evaluation Program has not produced any adverse effects on vehicles or equipment. The fleet consists of a wide range of commercial and military standard generator equipment.

During the first few weeks of operation on unleaded fuel, we had many new and imagined problems reported. Most of the problems reported were of a ridiculous nature and not at all fuel related. Some complaints were of engines dieseling. Although some engines did experience dieseling, there was no evidence of an increase over previously used gasoline.

One problem we felt sure would develop, and cause an increase work load during the first couple weeks of the evaluation, was engine timing adjustment, but the only adjustments made were performed during normal scheduled maintenance in performance of engine tune-up.

Personnel not aware of the fact that we are still on the unleaded fuel program have been known to report their vehicle runs better since we went back to leaded gasoline. This points out the fact that personnel have a tendency to believe unfounded rumors about the use of unleaded fuel.

During the first year of operation on this program, there has been no evidence of an increase in maintenance costs attributed to fuel related problems. Interviews with mechanics working in our maintenance facility confirm that we have had no increase in fuel related failures or maintenance requirements. The 351 V8 Ford (Windsor) Engine has been a problem prior to and during the evaluation program. This problem is however inherant in this particular engine design and not related to the unleaded fuel. The problem is in the valve guide area and it has been determined that Ford Motor Co. extended the warranty period because of this problem.

An area where it was felt problems would possibly develop, was in the older models vehicles. During the year of operation, this command had approximately 170 of its 320 vehicle fleet at an age of 1968 and older. To date, no problems have developed in these vehicles. Some of these older models have accumulated more than 10,000 miles during the evaluation period. There was concern that these vehicles would experience excessive valve recession using the unleaded gasoline. During April 1974, one of these vehicles was removed from service, due to it's overage, overmileage condition. This vehicle is a 1965 Ford F-250, 6 cylinder, 150 horsepower 3/4 Ton rated 4x4 pickup. This vehicle started on the program at 72,126 miles and when pulled from service at 86,983, a total of 14,857 miles using unleaded gasoline. In an effort to check for valve recession, etc. the engine was torn down. There was some valve guide wear but no abnormal valve seat wear. The mechanic involved stated that the valve guide wear was normal in this particular engine for the amount of mileage accumulated on the vehicle. Pictures were taken of component parts and are enclosed as Inclosures 1 through 11.

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During the evaluation period the vehicle and equipment fleet consumed a total of 317,137 gallons of unleaded gasoline. The vehicles were driven a total of 2,714,561 miles during the 12 month period and consumed 263,343 gallons of unleaded fuel for an overall average of 10 miles per gallon.

There has been no noticeable change in miles per gallon performance of vehicles in the fleet. Inclosure 12 reflect six months experience prior to beginning evaluation program and the first 6 months experience using unleaded fuel. This period of time is the most fair comparison because effective 1 July 1973, this Command went under a mandatory 50 miles per hour speed limit both on and off post. There may be some minor descrepancies in the figures shown, but for records available they are relatively accurate.

Inclosure 13 reflects the laboratory analysis of the unleaded gasoline used at Dugway Proving Ground during the evaluation program. The analysis was performed by U.S. Army Fuels and Lubricants Laboratory on samples taken from each load of fuel delivered to Dugway and samples drawn from storage tanks.

Since guidance from HQ, AMC indicated that Dugway Proving Ground will remain on the fuel evaluation program for an additional year, we will have the opportunity to evaluate some new vehicles. We have received 31 each, International Model 200 4x4 Pickup, 7000 GVW. These vehicles will be used primarily in the test areas under variable conditions. These vehicles are equipped with the 345 V8 Engine. To date we have also received 37 each

1/2 Ton 4x2 Chevrolet Pickups. These vehicles are equipped with the 350 V8 Engine. Eight of these Chevrolets have been assigned to the Security and Military Police Force and will accumulate high mileage and utilization in a short period of time. The only complaints received to date is the larger amount of fuel consumed by these new models.

No fuel related problems have developed in the Engineer Equipment using unleaded fuels. Many of the generators assigned have been used many hours over extended periods with no adverse effects, loss of power, or less efficient operation.

This one year of operation on unleaded gasoline, with some vehicles accumulating a high mileage rate, has shown that military, commercial design vehicles can operate as effectively and efficiently with unleaded fuel as they did with leaded gasoline.

Recommend that Dugway Proving Ground participate in this evaluation for an additional year to further evaluate the use of an unleaded fuel. The information accumulated to date is invaluable, but an additional one year period would further prove the possibilities of operating the military motor fleet on unleaded gasoline over prolonged periods.

RONALD J. VERDOORN
CPT, TC
Chief, Equipment Pool Branch

APPENDIX B

FINAL REPORT

Letterkenny Army Depot, Pennsylvania

FIRST YEAR REPORT

January 1973 to January 1974

UNLEADED GASOLINE EVALUATION PROGRAM

Conducted at

Letterkenny Army Depot
Chambersburg, PA 17201

Prepared By

ORVIL L. WENGER
LEAD Liaison Officer
US Army Unleaded Gasoline
Impact Program

I. BACKGROUND

In October, 1972, Letterkenny Army Depot was advised by AMC Headquarters that it had been selected as one of the field evaluation test sites for equipment performance on the low/unleaded gasoline impact program. The field evaluation program is being conducted on a day-to-day performance study of all vehicles of the GTA Fleet. With the rise of unleaded gasolines, this program was imperative at this time to determine if Army material is compatible with the new generation of gasolines and to determine any problems and a practical solution for each.

The program was instituted by AMC as a result of an official statement by President Nixon on actions to further the use of unleaded and low-leaded content gasoline in Federal and State vehicles, the primary goal being to "reduce air pollution and to increase the market for low-leaded and unleaded gasoline in order to make such fuels more generally available."

The starting date established for LEAD was 8 January 1973; however, Letterkenny was fueling its depot operating equipment with unleaded gasoline as early as January, 1972, since this was the only type fuel available from the supplier. Although no monitoring of vehicular performance was done prior to the program date, the depot had not experienced any abnormal problems that could be fuel-related.

The evaluation of the test program is under the general direction of the US Army Fuels and Lubricants Research Laboratory (USAFLRL), San Antonio, Texas, with Mr. John Tosh as USAFLRL's project phase coordinator. The undersigned is Letterkenny's liaison officer for the unleaded program.

II. SITE SELECTION

Letterkenny, one of four evaluation sites, was selected because it has a variety of vehicles, moderate to high utilization of such and climatic conditions different from the other test sites.

III. FUEL PROCUREMENT AND ANALYSIS

Procurement of the unleaded gasoline for Army vehicles is under Federal Specification VV-G-001690. This provides an octane quality to be held to a minimum 91 and a maximum 92.5 RON. The octane quality at Letterkenny continues to be higher than specified, averaging from 93 to 96 RON. Lead content has been well below the specified limit. The olefin content is significantly higher than the previous gasolines, but no obvious problems have resulted.

IV. VEHICLE UTILIZATION

As stated previously, all depot operating equipment (959 GTA, MHE and engineer-type engines) was utilizing unleaded gasoline as fuel for a considerable period of time, but with the inception of the unleaded gasoline program 309 vehicles of the GTA Fleet were specifically designated for evaluation. Identifying stickers were placed on each vehicle, recording starting mileage and starting date. The only vehicles not operating on unleaded gasoline are the three ambulances which are continuing to be fueled with standard gasoline.

V. PROBLEM ANALYSIS

In August, 1973, shop records indicated three bad heads on 1963 Model 345 International Vans, two of which were due to valve guide problems and the other was a catastrophic failure not attributable to fuel.

V. PROBLEM ANALYSIS (CONT'D)

Valve guide problems were also reported in three 351 Ford engines. These engines were later sent to the Research Laboratory and then to the Ford Company to determine if these failures were fuel-related or if they were inherent to this particular designed engine since other installations were having similar problems.

From August to December of 1973, the depot experienced problems with three Ford 361 CID engines. Valve seat inserts had fallen out of these engines in cylinders six and seven. Some indication of exhaust valve burning was also evident. Since then, two more 361 engines have developed problems. The last two were a 1968 5-ton tractor with 60,000 total miles (10,000 miles on unleaded gasoline) and a 1965 Ford tractor with total mileage of 47,000 (6,000 miles on unleaded gas). The exhaust valve seat insert on one of the four center cylinders had dropped out on all of these engines except the 1965 Ford tractor. It is assumed that this was due to the fuel mixture burning hotter with the unleaded gasoline and the engine not getting proper cooling. The 1965 Ford had a hole burned alongside the piston top and down into the ring lands. This was apparently from detonation. Other minor engine failures were encountered but there is no evidence to directly relate them to unleaded gasoline as similar failures occurred prior to converting to unleaded gasoline.

During the evaluation period the vehicles have consumed a total of 332,196 gallons of unleaded gasoline. Total mileage driven was 3,433,451 miles, with an overall average of 10.3 miles per gallon.

3

VI. TIME FRAME

The field evaluation program will be extended at LEAD and the three other installations for another 12 months. Extension of the program was considered after it was observed that all failures have occurred at relatively high mileage and the average mileage of most vehicles at the participating installations is just reaching the level where failures might occur to a greater extent.

Approximately 30 new vehicles have been added to the Fleet and the extended period will provide LEAD an opportunity to make a more accurate evaluation of the effects of unleaded gasoline on engine performance since the vehicles will be operating exclusively on this type of gasoline.

VII. FORMAL REPORTING

Print-outs of vehicle utilization have been furnished to Mr. Tosh on a quarterly basis. Mr. Tosh has made periodic visits to LEAD during the past year to discuss and observe problems related to the fuel program. Status meetings are held quarterly at which time representatives of the Research Laboratory and installation liaison officers present reports on the usage of unleaded fuel in Army engines.

for ORVIL L. WENGER
LEAD Liaison Officer
US Army Unleaded Gasoline
Impact Program

APPENDIX C

FINAL REPORT

Ft. Eustis, Virginia

Report of First Year's Efforts

1. The unleaded gasoline field evaluation officially began at Fort Eustis on 14 Mar 73. Initial conversion to unleaded gas was accomplished by systematically draining all installation gas storage tanks. Tanks were then allowed to dry for two days before being refueled with unleaded gasoline, Fed Spec W-G-001960. In order to minimize the lead content remaining in fuel systems, equipment was not refueled with unleaded gasoline the first time until fuel tanks were below the one fourth level. As each item was refueled the first time, it's identification and starting mileage was recorded. As of 31 May 73, the total number of items reported being coverted to unleaded gasoline were 259 commercial items and 117 tactical items. By 15 Apr 74, the number of tactical vehicles converted had increased to 135.

2. During the initial conversion period a problem came to light concerning the use of unleaded gas in the 32 two cycle outboard marine engines being maintained by the Special Services Division.

a. Operators manual for these engines recommends a regular grade leaded gasoline. Reference 1a above authorizes any equipment found to be incompatible with unleaded gas to be excluded from the evaluation. However, it was felt that procuring and maintaining two grades of gasoline on post would create management and supply problems.

b. Problem was solved by contacting the Warranty Manager for Mercury Marine in Fond Du Loc, Wisconsin, who in turn, furnished this command with a statement that unleaded gas was acceptable for use in their engine as long as it met the following requirements. (Incl 2)

(1) Minimum octane rating of 80.

(2) Maximum phosphorus content of .02 grams per gallon.

c. Followup action was taken by forwarding samples of locally available unleaded gas to AFLRL for analysis. Samples were found to be within the acceptable ranges established by Mercury Marine (Incl 3) and it was decided to include these engines in the unleaded gasoline evaluation.

d. It should be noted that unleaded gas was used throughout the entire boating season of 1973 and all reports have indicated it to be completely compatible with these engines.

e. A report of premature spark plug failure in the Mercury outboard engines was received in July 1973. Investigation of this problem revealed it to be one of improper oil mixtures and not fuel related.

3. In accordance with reference 1a, monthly visits were made to each maintenance activity to gather performance data and to furnish input data for the monthly unleaded gasoline report. To date, the only problem uncovered during these visits was that of an unusually high rate of valve train component failures in the commercial 351 CID Ford sedans.

a. A total of six 351 engines have failed as of 15 Apr 74. Five of these were Windsor engines and one Cleveland engine (Incl 4).

b. Due to the possibility of these failures being related to the use of unleaded gasoline, representatives from AFLRL, San Antonio, Texas, made several visits to Fort Eustis to analyze faulty components. In addition to these visits, a pair of cylinder heads were shipped to Ford Motor Company, Dearborne, Michigan for analysis.

c. It was announced during the fourth quarterly unleaded gasoline conference conducted at New Cumberland Army Depot, 28 Mar 74, that these failures have been determined to be caused by other sources than unleaded gasoline usage.

d. The first year of the evaluation at Fort Eustis has uncovered no significant operational or maintenance benefits from the use of unleaded gasoline. Areas concerned with the evaluation have consistently reported no problems or increases in maintenance costs associated with the use of unleaded gasoline. To date, no equipment has been found to be incompatible with unleaded gasoline. All vehicles reportedly have performed satisfactorily, and no item of equipment has been modified or altered in any way to perform this mission while operating on unleaded gasoline.

APPENDIX D

FINAL REPORT

Ft. Carson, Colorado

YEAR END REPORT

UNLEADED GASOLINE FIELD EVALUATION

Fort Carson, Colorado

30 April 1973 - 15 May 1973

Prepared by
MAJ GUY A. WILHELM

Special Projects Officer
DIO Plans & Operations
Fort Carson, Colorado 80913
AUTOVON 691-3233

1. Background:

a. As a preliminary step in the Army's program to reduce air pollution, Fort Carson and Fort Eustis were selected by CONARC to convert totally to unleaded gasoline for a period of one year. This was a test to determine what, if any, adverse effects would result from long-term usage of no-lead fuel in the many types of equipment used at the two installations. Dugway Proving Ground and Letterkenny Army Depot were also directed by AMC to participate in the test. See CONARC Letter of Instruction ATLOG-MS-EQ, Subject: Unleaded Gasoline Field Evaluation, dated 16 January 1973, with Sixth US Army 1st Indorsement AMLOG-M4 dated 1 February 1973 (Incl 1).

b. In implementation of CONARC's instructions, both written and telephonic, Fort Carson appointed a program coordinator and prepared a conversion plan. See Letter AMNCA-LOG-IT Subject: Unleaded Gasoline Field Evaluation dated 26 March 1973 (Incl 2).

c. The only difficulty in converting Fort Carson to no-lead gasoline was in redistributing the on-hand stocks of leaded fuel so they could be consumed in the least possible time. Total conversion was achieved on 30 April 1973.

2. Purpose: Tetraethyl lead, the principal additive in leaded gasoline, is a known contributor to air pollution and as such is a prime target for elimination. The US government hopes to lead the nation in switching to unleaded fuel but because of the vast quantities of equipment involved, does not dare to do so without some preliminary testing to determine what, if any, adverse effects may result. It is for this purpose the Army tests are being conducted.

3. Conduct of Test:

a. In accordance with CONARC guidelines at the outset of the test, no formal system was set up for capturing data. Instructions were disseminated to all commanders and maintenance supervisors to be aware of the test and to report problems or suspected problems on an exception basis. Contacts were made periodically between the coordinator and key personnel in the maintenance shops to determine whether or not any adverse trends were developing. Only one engine failure during the entire year was suspected of being fuel related and this, after teardown, proved to be a lubrication problem. There was no noticeable increase in engine failures, burned valves, spark plug usage, or similar problems.

b. In order to keep abreast of the rate at which miles were accruing, five of each type vehicle were selected as "pacers" and mileage on them reported monthly to CONARC. After dissolution of CONARC, 1 July 1973, FORSCOM and TRADOC became the recepients of these monthly reports.

c. Although no total gasoline burning vehicle mileage figures were kept for the post, a rough estimate is possible by multiplying the average mileage on the pacers by the number of those type vehicles in the fleet.

VEHICLE TYPE	AVG MILEAGE	DENSITY	TOTAL ESTIMATED MILEAGE
1/4 T Trucks	4,801	1,115	5,353,115
1-1/4 T Trucks	1,631	440	717,640
M114 Series	346	140	48,440
M88 VTR's	748	28	20,944
M113 Carrier Family	1,104	322	355,488
5T Trucks	1,956	55	107,580
Commercial	8,821	431	3,802,260
		TOTAL	10,405,467

d. During the period 1 May 1973 - 30 April 1974 Fort Carson consumed 1,700,406 gallons of no-lead gasoline.

4. Conclusion: In view of the foregoing experience factors, it is reasonable to assume that Fort Carson can continue to operate on no-lead gasoline without adverse effects to the equipment.

2 Incl
as

JOHN T. MOON
MAJ, QM
Chief, P&O Div, DIO

APPENDIX E

FIELD STUDY EVALUATION

Vehicles and Equipment

Section 1. Dugway Proving Ground, Utah
Section 2. Letterkenny Army Depot, Pennsylvania
Section 3. Fort Eustis, Virginia
Section 4. Fort Carson, Colorado

APPENDIX E

Section 1
Dugway Proving Ground, Utah

TMP	USA	Year	Make	Pool
Equipment Pool Branch				
1	CA0405	72	Ford	E
2	CA1477	72	Ford	E
4	01F64371	71	Ford	E
5	CB2272	73	Chev	E
6	01F63371	71	Ford	E
7	01F63971	71	Ford	E
9	CA1480	72	Ford	E
11	01F63571	71	Ford	E
12	01F63471	71	Ford	E
13	01F64671	71	Ford	E
15	01H42770	80	Ford	E
17	CB2274	73	Chev	E
19	01F63771	71	Ford	E
21	01H42570	70	Ford	E
22	CA1476	72	Ford	E
23	CB2273	73	Chev	E
24	01F64071	71	Ford	E
26	01F63871	71	Ford	E
27	CA1478	72	Ford	E
29	01H42170	70	Ford	E
31	CA2523	72	AMC	E
33	01A61371	71	Checker	E
43	CA5371	72	IHC	E
44	CA5336	72	IHC	E
56	IM5203	65	GMC	E
58	IM5140	65	GMC	E
60	IM5202	65	GMC	E
65	CB0130	73	Chev	E
66	01H71971	71	Ford	E
67	01H71871	71	Ford	E
75	01K017/0	70	Ford	E
88	IS3321	67	Chev	E
113	IN1676	65	Ford	D
127	IP9476	66	Chev	E
171	01C07671	71	Dodge	E
179	IN1619	65	Ford	E
200	IR0456	66	Ford	E
201	IR6824	66	Ford	E
219	IS4256	67	Chev	E
220	IS4261	67	Chev	E
239	IN7389	65	Ford	D
266	IN7383	65	Ford	D
271	IM0063	64	Dodge	D
281	IM0064	64	Dodge	D
297	01J36769	69	Dodge	E
299	01J36969	69	Dodge	E
324	01A42970	70	Dodge	E
326	01S88870	70	Dodge	E
344	IS2174	67	Ford	E
357	IS1822	67	Ford	D

TMP	USA	Year	Make	Pool
		Equipment Pool Branch (Cont'd)		
358	IS1823	67	Ford	D
361	IS1826	67	Ford	D
362	IS1827	67	Ford	E
373	IR4214	66	Chev	E
379	01B36567	67	Ford	D
381	01B36767	67	Ford	E
398	IN5959	65	Ford	E
399	IN6253	65	Ford	E
400	IK0802	63	IHC	E
401	01C37168	68	Ford	E
402	IR3028	66	IHC	E
403	IL9729	64	IHC	E
416	IK8370	63	IHC	E
417	IK8369	63	IHC	E
419	IN7255	65	IHC	E
420	IK2000	63	IHC	E
427	7F2522	64	Transport	E
428	7F2523	64	Transport	D
429	01235374	51	Dorsey	D
431	07G17469	69	Rogers	E
435	07F85869	69	Troyler	E
436	07F85869	69	Troyler	E
437	07F86069	69	Troyler	E
438	07F30269	69	Stoughton	E
495	01S24768	68	IHC	E
500	IP5125	65	Dodge	D
503	IP5128	65	Dodge	D
504	IP5129	65	Dodge	D
505	IP5130	65	Dodge	D
506	IP5131	65	Dodge	D
Total: 80				
		65th Military Police Platoon		
MP1	01F63671	71	Ford	E
MP2	CA2525	72	AMC	E
MP3	CA2524	72	AMC	E
MP4	01F64571	71	Ford	E
MP5	01F64171	71	Ford	E
Total: 5				
		Security		
72	01K02070	70	Ford	E
90	IS3315	67	Chev	E
108	01C07171	71	Dodge	E
110	CA4466	72	Chev	E
130	01C07571	71	Dodge	E
175	01C07871	71	Dodge	E
205	CA4468	72	Chev	E
Total: 7				

TMP	USA	Year	Make	Pool
		Meddac		
3	CA1475	72	Ford	E
20	CA2522	72	AMC	D
76	G1L30669	69	Pont	E
77	CA2976	72	Dodge	E
78	CA2925	72	Dodge	E
79	CA2935	72	Dodge	E
80	CA2977	72	Dodge	E
81	CA2910	72	Dodge	E
82	01A25472	72	Dodge	E
84	CA6001	72	IHC	E
85	CA6013	73	IHC	E
86	CA2953	72	Dodge	E
87	CA6012	73	IHC	E
190	01A54669	69	IHC	E
Total: 14				
		Aircraft Maintenance Contractor		
PAMI 1	01F85569	69	AMC	D
PAMI 2	IN1667	65	Ford	D
PAMI 3	01A32870	70	IHC	D
PAMI 8	01A33670	70	IHC	D
Total: 4				
		Facilities Engineering Division		
73	01K01870	70	Ford	E
89	IS3317	67	Chev	E
92	IP9467	66	Chev	E
93	01J81368	68	Chev	E
95	IN1685	65	Ford	E
98	01J79568	68	Chev	E
99	01D92072	72	Chev	E
100	IP9457	66	Chev	D
101	IL8230	64	Dodge	E
103	IP9468	66	Chev	E
105	IP9456	66	Chev	E
109	01J81168	68	Chev	E
111	IP9423	66	Chev	E
115	IN1670	65	Ford	E
116	01J79368	68	Chev	E
118	IN1673	65	Ford	E
121	01C07471	71	Dodge	E
123	01J80668	68	Chev	E
124	IN1674	65	Ford	E
125	01J83868	68	Chev	E
128	01K01970	70	Ford	E
129	CA4475	72	Chev	E
131	01C07771	71	Dodge	E
132	IP9478	66	Chev	E

TMP	USA	Year	Make	Pool
Facilities Engineering Division (Cont'd)				
134	CA4476	72	Chev	E
135	IP9475	66	Chev	E
137	IN1671	65	Ford	E
141	01J82268	68	Chev	E
142	IN1679	65	Ford	E
143	IP9461	66	Chev	E
147	01J79468	68	Chev	E
149	IP9466	66	Chev	E
152	01J80868	68	Chev	E
154	IP9455	66	Chev	E
155	IP9472	66	Chev	D
156	01K06670	70	Ford	E
157	01J82068	68	Chev	E
158	01C06971	71	Dodge	E
160	CA4464	72	Chev	E
161	IN1682	65	Ford	E
167	IP9480	66	Chev	E
170	01K02170	70	Ford	E
173	01J33563	63	Ford	E
183	01J79268	68	Chev	E
185	01E19769	69	Chev	E
188	01E20069	69	Chev	E
189	CA4470	72	Chev	E
203	CA4474	72	Chev	E
204	CA4467	72	Chev	E
387	IL1481	64	Ford	E
389	IL1482	64	Ford	E
390	IN5916	65	Ford	D
391	IN5909	65	Ford	D
392	IN5915	65	Ford	D
393	IN5925	65	Ford	D
395	IL9135	64	IHC	E
405	01C77370	70	IHC	D
Total: 57				
Fire Prevention				
8	CA1479	72	Ford	E
71	01K02370	70	Ford	E
120	IP9450	66	Chev	D
Total: 3				
Safety				
18	CA2521	72	AMC	E
126	01C07371	71	Dodge	E
117	IP9474	66	Chev	D
265	IN7404	65	Ford	D
285	IM0067	64	Dodge	D
Total: 5				

TMP	USA	Year	Make	Pool
		Mail & Records		
164 162 Total: 2	IN1668 IN1666	65 65	Ford Ford	E E
		HHC Supply		
176 Total: 1	CA4469	72	Chev	E
		Supply Management Branch		
138 168 169 Total: 3	IP9447 CA4473 IP9452	66 72 66	Chev Chev Chev	E E E
		Commissary		
323 Total: 1	01S88770	70	Dodge	E
		Housing		
102 148 325 174 Total: 4	01C07071 CA4471 01A43070 CA4472	71 72 70 72	Dodge Chev Dodge Chev	E E E E
		Maintenance Branch		
97 382 Total: 2	01K06770 01B36867	70 67	Ford Ford	E E
		Metal Shop		
182 359 Total: 2	01J79968 IS1824	68 67	Chev Ford	E E
		Golf Course		
139 Total: 1	IN1677	65	Ford	E
		Photo Branch		
145 207	01J81068 01N73070	68 70	Chev Chev	D D

TMP	USA	Year	Make	Pool
Photo Branch (Cont'd)				
215	01N72770	70	Chev	D
290	IM0068	64	Dodge	D
330	IM3065	64	Dodge	D
331	IM3066	64	Dodge	D
334	IN6589	65	IHC	D
Total: 7				
Munitions Branch				
104	01J82368	68	Chev	D
136	IN1681	65	Ford	D
150	IP9424	66	Chev	D
163	01D91972	72	Chev	D
165	IP9479	66	Chev	D
181	01J80468	68	Chev	D
186	01K06570	70	Ford	D
211	01N73670	70	Chev	D
221	IS4254	67	Chev	D
243	IN7373	65	Ford	D
248	IN7412	65	Ford	D
258	IM0074	64	Dodge	D
275	IN7413	65	Ford	D
276	IN7405	65	Ford	D
278	IM0061	64	Dodge	D
289	IN7421	65	Ford	D
301	01J96469	69	Chev	D
356	IS1821	67	Ford	D
475	01S22468	68	IHC	D
479	01S22868	68	IHC	D
499	IP5124	65	Dodge	D
Total: 21				
Engineering Branch				
166	IN1665	65	Ford	D
Total: 1				
Test Division				
14	01F64271	71	Ford	D
146	01J79768	68	Chev	D
262	IN7390	65	Ford	D
268	IN7399	65	Ford	D
279	IN7393	65	Ford	D
498	IP5123	65	Dodge	D
Total: 6				
Test Control Branch				
180	01J81568	68	Chev	D

TMP	USA	Year	Make	Pool
Test Control Branch (Cont'd)				
224	01N73170	70	Chev	D
225	01N73370	70	Chev	D
228	01N73770	70	Chev	D
231	IN7420	65	Ford	D
300	01J96369	69	Chev	D
Grid Services Branch				
140	IN1680	65	Ford	D
159	iN1660	65	Ford	D
177	IN1683	65	Ford	D
244	IN7422	65	Ford	D
250	IN7397	65	Ford	D
254	IN7379	65	Ford	D
263	IN7392	65	Ford	D
291	IN7401	65	Ford	D
295	IN7411	65	Ford	D
380	01B36667	67	Ford	D
386	IN5761	65	Dodge	D
388	IR6305	66	Ford	D
496	01S24868	68	IHC	D
497	01S24968	68	IHC	D
507	IP5132	65	Dodge	D
Total: 15				
Protective Branch				
184	01E19669	69	Chev	D
227	01N72670	70	Chev	D
246	IN7374	65	Ford	D
329	IM3064	64	Dodge	D
481	01S23068	68	IHC	D
Total: 5				
Grid Operations Branch				
468	01S23568	68	IHC	D
469	01S22068	68	IHC	D
470	01S22968	68	IHC	D
471	01S23768	68	IHC	D
472	01S22368	68	IHC	D
473	01S22668	68	IHC	D
474	01S23368	68	IHC	D
476	01S22568	68	IHC	D
477	01S24368	68	IHC	D
478	01S24168	68	IHC	D
480	01S23968	68	IHC	D
482	01S22168	68	IHC	D
483	01S24268	68	IHC	D
484	01S24468	68	IHC	D

TMP	USA	Year	Make	Pool
Grid Operations Branch (Cont'd)				
485	01S23468	68	IHC	D
486	01S24068	68	IHC	D
487	01S22768	68	IHC	D
488	01S23868	68	IHC	D
489	01S23268	68	IHC	D
490	01S22268	68	IHC	D
491	01S23168	68	IHC	D
492	01S23668	68	IHC	D
493	01S24568	68	IHC	D
494	01S24668	68	IHC	D
Total: 24				
Life Sciences Laboratory Division				
10	01H41970	70	Ford	D
144	01C07971	71	Dodge	D
153	01J81868	68	Chev	D
172	IN1678	65	Ford	D
193	01M09670	70	IHC	D
238	IM0060	64	Dodge	D
240	IN7423	65	Ford	D
255	IN7398	65	Ford	D
287	IN7425	65	Ford	D
345	IS2173	67	Ford	D
378	01B36467	67	Ford	D
501	IP5126	65	Dodge	D
502	IP5127	65	Dodge	D
Total: 13				
Chem Lab Division				
112	IR7633	66	Chev	D
Total: 1				
Meteorology Division				
25	01H42370	70	Ford	E
Total: 1				
Met Operations Branch				
206	01N73270	70	Chev	D
218	01N73470	70	Chev	D
223	01N72970	70	Chev	D
233	IN7414	65	Ford	D
237	IN7406	65	Ford	D
Total: 5				
Communications Branch				
199	01B13671	71	Dodge	E
Total: 1				

TMP	USA	Year	Make	Pool
Re-Enlistment NCOIC				
16 Total: 1	01F64471	71	Ford	E
Procurement Office				
178 Total: 1	01J81768	68	Chev	SLC
Quality Assurance Office				
191 Total: 1	01M09570	70	IHC	E
Calibration Branch				
298 Total: 1	01J36869	69	Dodge	D
Suitability Evaluation				
217 Total: 1	01N45070	70	Chev	E
Chemical Technology Branch				
202 Total: 1	IR8615	66	Ford	D
Instrument Maintenance Branch				
74 94 107 282 360 363 Total: 6	01K02270 01J82168 CA4465 IN7416 IS1825 IS1828	70 68 72 65 67 67	Ford Chev Chev Ford Ford Ford	D D D D D D
Sig Met Team				
119 216 222 208 226 261 267 280 Total: 8	01C07271 01N44970 IS4255 01N72870 01N73570 IN7380 IN7408 IN7395	71 70 67 70 70 65 65 65	Dodge Chev Chev Chev Chev Ford Ford Ford	D D D D D D D D

Admin No.	Vehicle	Year	Make	Serial No.	USA No.
801	Trk Fork	64	A/C	26117000	10663380
802	Trk Fork	64	A/C	26095000	10663210
803	Bomb Lift	64	Intferm	47	47
804	Trk Fork	64	A/C	25669000	10663079
805	Trk Fork	64	A/C	26092000	10663320
806	Trk Fork	65	A/C	26203000	10663370
808	Trk Fork	64	A/C	26119000	10663219
809	Trk Fork	65	A/C	26172000	10663349
810	Bomb Lift	64	Intferm	48	48
807	Trk Fork	64	A/C	25462000	10363466
811	Trk Fork	64	A/C	30653000	10363233
812	Trk Fork	64	A/C	25277000	10363345
813	Trk Fork	64	A/C	25461000	10363463
817	Tractor	64	Clark	RA226	10263569
818	Tractor	64	Clark	RR301	10263644
819	Tractor	64	Clark	RA162	10263505
820	Tractor	64	Clark	RR247	10263590
824	Trk Fork	64	Clark	RP545	10463432
826	Trk Fork	64	Tow Mtr	M502P650027	10464039
827	Trk Fork	64	Tow Mtr	M502P650009	10464040
880	Trk Fork	62	Hyster	C6D1644F	10361106
881	Trk Fork	63	Hyster	C6D2159G	10863168
550	Grader	57	Cat	8T21508	8A7373
551	Grader	67	Cat	8T21511	8A7376
552	Grader	57	Cat	99E6625	8C5062
553	Grader	63	Cat	99E6626	8C5061
555	Grader	62	Huber	MD1068	8B8529
586	Crane	65	Little Giant	326568	8D5156
587	Crane	60	Quickway	20350	8B1372
588	Crane	65	American	GS6595W	8C6868
590	Crane	66	Unit	66272	8D8753
619	Cbl Lyr			SC159	SC159
644	Comp Trk	66	Jaeger	RC27968	8D8278
655	Trk Rfuse	73	IHC	2J791CCA12889	CA7359
657	Trk Dist	52	Roscoe	1469	8016023
658	Trk Dist	59	Etmyre	307996	5B9430
655	Loader	65	Hale	621177	8D4749
669	Ditcher	63	Charles M.W.	5229	5229
671	Roller	65	Gallion	TC58G50393	8D4597
673	Sweeper	64	Elgin	K527C53	K527C53
674	Sweeper	43	F.G. Hough	TTS291	0112816
688	Roller	49	William B.	3129	0744048
692	Magnet	66	Eriez	28007C	N/A
700	Lub Unit	58	Cemco	2361	01401351
703	Mixer	55	Essick	52911547	N/A
704	Mixer	66	Gilson	2366	N/A
705	Mixer	59	Mueller	42392	N/A
710	Scraper	51	Deerborn	45201	N/A
790	Tractor	65	Cat	42A6244	8D4599
793	Tractor	70	Case	7300323	08C36270
791	Tractor			9202155	2U15143
792	Tractor	52	Cat	2U14885	9202515

Admin No.	Vehicle	Year	Make	Serial No.	USA No.
832	Tractor	73	Case	8726586	N/A
833	Tractor	64	IHC	5615J	N/A
834	Tractor	64	IHC	5610J	N/A
835	Tractor	64	IHC	5607J	N/A
837	Tractor	58	Oliver	4210087116	4753384
838	Tractor	63	IHC	8875601	N/A
Total: 58					

GENERATOR ROSTER

Bumper No.	Serial No.	Size	Stock No.	Make	Year	Model
B02						
B07	738636	5 KW	61150748830	Onan	1964	8XR3100A
B09	738506	5 KW	61150748830	Onan	1964	5GF8XR3100A
B10	738561	5 KW	61150748830	Onan	1964	5GF8XR3100A
B12						
B24	981977	5 KW	6115X971148	Onan	1967	5 CCK
B25						
B26	981979	5 KW	6115X971148	Studebaker	1967	5 CCK
B27	981980	5 KW	6115X971148	Onan	1967	5 CCK
B28	981931	5 KW	6115X971148	Onan	1967	5 CCK
B29	981982	5 KW	6115X971148	Onan	1967	5 CCK
B30	981983	5 KW	6115X971148	Onan	1967	5 CCK
B31	981984	5 KW	6115X971148	Onan	1967	5 CCK
B32	981985	5 KW	6115X971148	Onan	1967	5 CCK
B33						
C01	FA651332	10 KW	61157928260	Fermont	1966	J109
C02						
C03	FA6500900	10 KW	61157928260	Fermont	1966	J109
C04	FA6403785	10 KW	61157928260	Fermont	1966	SF 10 MD
C05	FA650431	10 KW	61157928260	Fermont	1966	SF 10 MD
C06	FA651344	10 KW	61157928260	Fermont	1966	J109
C07	FA6403787	10 KW	6115798260	Fermont	1966	J109
C08						
C09	FA644076	10 KW	61157928260	Fermont	1966	J109
C10						
C11						
C12	FA6501339	10 KW	61157928260	Fermont	1966	J109
C13						
C14	FA651353	10 KW	61157928260	Fermont	1966	J109
C17	25301	10 KW	6115X976748	Marble Card	1947	J4
C18	26752	10 KW	6115X976748	Marble Card	1947	J4
C19	87C981576	10 KW	6115X971147	Studebaker	1967	10RJC4N4A
C20	87C981575	10 KW	6115X971147	Studebaker	1967	10RJC4N4A
D21	290243	25 KW	6115X971149	Kohler	1967	30R081
D22	290244	25 KW	6115X971149	Kohler	1967	30R081
D23	290245	25 KW	6115X971149	Kohler	1967	30R081
D24	290246	25 KW	6115X971149	Kohler	1967	30R081
D25	290247	25 KW	6115X971149	Kohler	1967	30R081
C26	FA6403805	10 KW	61157928260	Fermont	1966	J109
C27	FA6501340	10 KW	61157928260	Fermont	1966	J109
C21	87C981574	10 KW	6115X971147	Studebaker	1967	10RJC4N4A
C22	87C981577	10 KW	6115X971147	Studebaker	1967	10RJC4N4A
C23	87C981578	10 KW	6115X971147	Studebaker	1967	10RJC4N4A
C24	FA651376	10 KW	61157928260	Fermont	1966	J109
C25	FA6403781	10 KW	61157928260	Fermont	1966	J109
D26	290248	25 KW	6115X971149	Kholer	1967	30R081
D27	290249	25 KW	6115X971149	Kohler	1967	30R081
D28	HA3210212	25 KW	6115X971149	Kohler	1967	30R081
D29	290251	25 KW	6115X971149	Kohler	1967	30R081

GENERATOR ROSTER (Cont'd)

Bumper No.	Serial No.	Size	Stock No.	Make	Year	Model
D30	290252	25 KW	6115X971149	Kohler	1967	30R081
E01	27979A	60 KW	6115X971146	Stevens	1964	3400
E02	98285	60 KW	6115X971146	Gene Elect	1967	3400
E03	97979B	60 KW	6115X971146	Palmer Elect	1967	3400
E04	97225	60 KW	6115X971146	Electric Mach	1967	3400
E05	EA671026	60 KW	61159374388	Onan	1969	60 MD/CIED
F02	96840	100 KW	6115X971145	Allis Chalmers	1967	11000
F03	96666	100 KW	6115X971145	Allis Chalmers	1967	11000
F51	11	100 KW	61157983444	Detroit Diesel	1963	6910A
F54	19	100 KW	61157983444	Detroit Diesel	1966	6910A
F55	55	100 KW	61157983444	Detroit Diesel	1966	6910A
F56	46	100 KW	61157983444	Detroit Diesel	1966	6910A
F57	154	100 KW	61153C15761	Consolidated Diesel	1963	4180
F58	153	100 KW	61153015761	Consolidated Diesel	1963	4180
F60	418046	100 KW	61153015761	Consolidated Diesel	1963	4180
F01	98002	100 KW	6115X971145	Allis Chalmers	1967	11000
Total: 65						

APPENDIX E

Section 2
Letterkenny Army Depot, Pennsylvania

Serial No.	Make, Model	Description
A0S33		Lift off aerial bucket
A00S1		Truck, 4-Ton
Q0001	1964	Truck, Fork Lift, 2000 lb
Q0002	1964	Truck, Fork Lift, 2000 lb
Q0003	1964	Truck, Fork Lift, 2000 lb
Q0080	1953	Crane, Trk element, 6000 lb
Q0081	1966	Crane, Truck Fork, 10,000 lb
Q0082	1966	Crane, Truck Ford, 10,000 lb
Q0101	1962	Truck, Fork Lift, 4000 lb
Q0102	1962	Truck, Fork Lift, 4000 lb
Q0103	1962	Truck, Fork Lift, 4000 lb
Q0104	1962	Truck, Fork Lift, 4000 lb
Q0105	1962	Truck, Fork Lift, 4000 lb
Q0106	1970	Truck, Fork Lift, 4000 lb
Q0107	1970	Truck, Fork Lift, 4000 lb
Q0108	1960	Truck, Fork Lift, 4000 lb
Q0109	1965	Truck, Fork Lift, 4000 lb
Q0110	1965	Truck, Fork Lift, 4000 lb
Q0111	1965	Truck, Fork Lift, 4000 lb
Q0112	1965	Truck, Fork Lift, 4000 lb
Q0113	1964	Truck, Fork Lift, 4000 lb
Q0137	1965	Truck, Fork Lift, 4000 lb
Q0139	1965	Truck, Fork Lift, 4000 lb
Q0140	1965	Truck, Fork Lift, 4000 lb
Q0141	1954	Truck, Fork Lift, 4000 lb
Q0142	1965	Truck, Fork Lift, 4000 lb
Q0393	1971	Truck, Fork Lift, 4000 lb
Q0394	1971	Truck, Fork Lift, 4000 lb
Q0395	1971	Truck, Fork Lift, 4000 lb
Q0396	1971	Truck, Fork Lift, 4000 lb
Q0397	1971	Truck, Fork Lift, 4000 lb
Q0398	1971	Truck, Fork Lift, 4000 lb
Q0399	1971	Truck, Fork Lift, 4000 lb
Q0400	1971	Truck, Fork Lift, 4000 lb
Q0402	1971	Truck, Fork Lift, 4000 lb
Q0404	1964	Truck, Fork Lift, 4000 lb
Q0406	1971	Truck, Fork Lift, 4000 lb
Q0408	1971	Truck, Fork Lift, 4000 lb
Q0409	1958	Truck, Fork Lift, 4000 lb
Q0410	1971	Truck, Fork Lift, 4000 lb
Q0413	1971	Truck, Fork Lift, 4000 lb
Q0414	1964	Truck, Fork Lift, 4000 lb
Q0415	1971	Truck, Fork Lift, 4000 lb
Q0416	1971	Truck, Fork Lift, 4000 lb
Q0417	1971	Truck, Fork Lift, 4000 lb
Q0418	1971	Truck, Fork Lift, 4000 lb
Q0419	1971	Truck, Fork Lift, 4000 lb
Q0423	1971	Truck, Fork Lift, 4000 lb
Q0426	1964	Truck, Fork Lift, 4000 lb
Q0427	1971	Truck, Fork Lift, 4000 lb
Q0428	1958	Truck, Fork Lift, 4000 lb

Serial No.	Make, Model	Description
Q0431	1958	Truck, Fork Lift, 4000 lb
Q0435	1958	Truck, Fork Lift, 4000 lb
Q0438	1971	Truck, Fork Lift, 4000 lb
Q0440	1971	Truck, Fork Lift, 4000 lb
Q0441	1958	Truck, Fork Lift, 4000 lb
Q0443	1958	Truck, Fork Lift, 4000 lb
Q0444	1971	Truck, Fork Lift, 4000 lb
Q0445	1971	Truck, Fork Lift, 4000 lb
Q0448	1971	Truck, Fork Lift, 4000 lb
Q0457	1964	Truck, Fork Lift, 4000 lb
Q0458	1965	Truck, Fork Lift, 4000 lb
Q0459	1965	Truck, Fork Lift, 4000 lb
Q0460	1965	Truck, Fork Lift, 4000 lb
Q0461	1965	Truck, Fork Lift, 4000 lb
Q0462	1965	Truck, Fork Lift, 4000 lb
Q0463	1965	Truck, Fork Lift, 4000 lb
Q0464	1965	Truck, Fork Lift, 4000 lb
Q0465	1965	Truck, Fork Lift, 4000 lb
Q0466	1965	Truck, Fork Lift, 4000 lb
Q0467	1965	Truck, Fork Lift, 4000 lb
Q0468	1964	Truck, Fork Lift, 4000 lb
Q0469	1964	Truck, Fork Lift, 4000 lb
Q0470	1958	Truck, Fork Lift, 4000 lb
Q0471	1964	Truck, Fork Lift, 4000 lb
Q0472	1964	Truck, Fork Lift, 4000 lb
Q0473	1964	Truck, Fork Lift, 4000 lb
Q0474	1964	Truck, Fork Lift, 4000 lb
Q0475	1965	Truck, Fork Lift, 4000 lb
Q0476	1965	Truck, Fork Lift, 4000 lb
Q0484	1965	Truck, Fork Lift, 4000 lb
Q0485	1964	Truck, Fork Lift, 4000 lb
Q0486	1964	Truck, Fork Lift, 4000 lb
Q0487	1971	Truck, Fork Lift, 4000 lb
Q0488	1971	Truck, Fork Lift, 4000 lb
Q0489	1971	Truck, Fork Lift, 4000 lb
Q0490	1971	Truck, Fork Lift, 4000 lb
Q0491	1971	Truck, Fork Lift, 4000 lb
Q0492	1971	Truck, Fork Lift, 4000 lb
Q0493	1971	Truck, Fork Lift, 4000 lb
Q0494	1971	Truck, Fork Lift, 4000 lb
Q0495	1971	Truck, Fork Lift, 4000 lb
Q0496	1971	Truck, Fork Lift, 4000 lb
Q0497	1971	Truck, Fork Lift, 4000 lb
Q0498	1971	Truck, Fork Lift, 4000 lb
Q0499	1971	Truck, Fork Lift, 4000 lb
Q0501	1962	Truck, Fork Lift, 6000 lb
Q0502	1964	Truck, Fork Lift, 6000 lb
Q0503	1962	Truck, Fork Lift, 6000 lb
Q0504	1964	Truck, Fork Lift, 6000 lb
Q0505	1964	Truck, Fork Lift, 6000 lb
Q0506	1962	Truck, Fork Lift, 6000 lb

Serial No.	Make, Model		Description
Q0507		1962	Truck, Fork Lift, 6000 lb
Q0508		1964	Truck, Fork Lift, 6000 lb
Q0509		1964	Truck, Fork Lift, 6000 lb
Q0510		1964	Truck, Fork Lift, 6000 lb
Q0511		1962	Truck, Fork Lift, 6000 lb
Q0512		1962	Truck, Fork Lift, 6000 lb
Q0515		1964	Truck, Fork Lift, 6000 lb
Q0516		1964	Truck, Fork Lift, 6000 lb
Q0517		1964	Truck, Fork Lift, 6000 lb
Q0518		1964	Truck, Fork Lift, 6000 lb
Q0519		1964	Truck, Fork Lift, 6000 lb
Q0520		1964	Truck, Fork Lift, 6000 lb
Q0521		1964	Truck, Fork Lift, 6000 lb
Q0522		1964	Truck, Fork Lift, 6000 lb
Q0523		1964	Truck, Fork Lift, 6000 lb
Q0524		1964	Truck, Fork Lift, 6000 lb
Q0525		1964	Truck, Fork Lift, 6000 lb
Q0526		1964	Truck, Fork Lift, 6000 lb
Q0531		1965	Truck, Fork Lift, 6000 lb
Q0532		1965	Truck, Fork Lift, 6000 lb
Q0533		1965	Truck, Fork Lift, 6000 lb
0Q534		1965	Truck, Fork Lift, 6000 lb
Q0535		1965	Truck, Fork Lift, 6000 lb
Q0536		1965	Truck, Fork Lift, 6000 lb
Q0544		1962	Truck, Fork Lift, 6000 lb
Q0602	Minn Moline	1960	Tractor, Gas, 4000 lb
Q0603	"	1960	Tractor, Gas, 4000 lb
Q0604	"	1960	Tractor, Gas, 4000 lb
Q0605	"	1960	Tractor, Gas, 4000 lb
Q0606	"	1960	Tractor, Gas, 4000 lb
Q0607	"	1960	Tractor, Gas, 4000 lb
Q0615	"	1960	Tractor, Gas, 4000 lb
Q0616	"	1960	Tractor, Gas, 4000 lb
Q0617	"	1960	Tractor, Gas, 4000 lb
Q0618	"	1960	Tractor, Gas, 4000 lb
Q0619	"	1960	Tractor, Gas, 4000 lb
Q0621	"	1960	Tractor, Gas, 4000 lb
Q0622	"	1960	Tractor, Gas, 4000 lb
Q0624	"	1960	Tractor, Gas, 4000 lb
Q0625	"	1960	Tractor, Gas, 4000 lb
Q0627	"	1960	Tractor, Gas, 4000 lb
Q0628	"	1960	Tractor, Gas, 4000 lb
Q0629	"	1960	Tractor, Gas, 4000 lb
Q0632	"	1960	Tractor, Gas, 4000 lb
Q0633	"	1960	Tractor, Gas, 4000 lb
Q0636	"	1960	Tractor, Gas, 4000 lb
Q0650	"	1960	Tractor, Gas, 4000 lb
Q0700		1963	Truck, Fork, Gas, 15,000 lb
Q0701		1963	Truck, Fork, Gas, 15,000 lb
Q0702		1963	Truck, Fork, Gas, 15,000 lb

Serial No.	Make, Model		Description
Q0703		1963	Truck, Fork, Gas, 15,000 lb
Q0704		1963	Truck, Fork, Gas, 15,000 lb
Q0705		1963	Truck, Fork, Gas, 15,000 lb
Q0706		1963	Truck, Fork, Gas, 15,000 lb
Q0707		1963	Truck, Fork, Gas, 15,000 lb
Q0708		1963	Truck, Fork, Gas, 15,000 lb
Q0709		1963	Truck, Fork, Gas, 15,000 lb
Q0710		1963	Truck, Fork, Gas, 15,000 lb
Q0711		1963	Truck, Fork, Gas, 15,000 lb
Q0715		1958	Truck, Fork, Gas, 20,000 lb
AO782	Ford	1965	Truck, Tractor, 28,000 GVW
AO783	Ford	1965	Truck, Tractor, 28,000 GVW
AO787	IHC	1964	Truck, Tractor, 28,000 GVW
AO789	IHC	1964	Truck, Tractor, 28,000 GVW
AO791	Ford	1965	Truck, Tractor, 28,000 GVW
AO794	Ford	1965	Truck, Tractor, 28,000 GVW
AO796	Ford	1965	Truck, Tractor, 5-ton
AO798	IHC	1964	Truck, Tractor, 28,000 GVW
AO801	IHC	1972	Truck, Tractor, 39,500 GVW 6 X 4
AO854	IHC	1962	Truck, Dump, 41,980 GVW
AO856	IHC	1969	Truck, Dump, 28,000 GVW 4 X 2
AO857	IHC	1969	Truck, Dump, 28,000 GVW 4 X 2
AO863	IHC	1962	Truck, Dump, 41,980 GVW
AO866	IHC	1962	Truck, Dump, 24,000 GVW
AO867	IHC	1962	Truck, Dump, 24,000 GVW
AO869	IHC	1962	Truck, Dump, 24,000 GVW
AO873	IHC	1962	Truck, Dump, 24,000 GVW
AO874	IHC	1962	Truck, Dump, 24,000 GVW 4 X 2
A0878	IHC	1971	Truck, Dump, 28,000 GVW 4 X 2
A0879	IHC	1971	Truck, Dump, 28,000 GVW 4 X 2
A0880	IHC	1971	Truck, Dump, 28,000 GVW 4 X 2
AO881	IHC	1971	Truck, Dump, 28,000 GVW 4 X 2
AO884	IHC	1966	Truck, Dump, 28,000 GVW 4 X 2
AO891	Checker	1973	Bus, 12 Pax, 4 X 2, 7,680 GVW
AO892	Checker	1973	Bus, 12 Pax, 4 X 2, 5,300 GVW
AO895	Ford	1963	Bus, 20 Pax, 14,000 GVW
AO896	Dodge	1963	Bus, 20 Pax, 14,000 GVW
AO897	Dodge	1963	Bus, 20 Pax, 14,000 GVW
AO898	IHC	1972	Bus, 25 Pax, 19 460 GVW
AO899	Dodge	1963	Bus, 25 Pax, 19,460 GVW
AO900	IHC	1972	Bus, 25 Pax, 19,460 GVW
AO940	IHC	1963	Bus, Amb. 44 Pax, 30,000 GVW
AO942	IHC	1965	Bus, Amb. 44 Pax, 30,000 GVW
AO955	Scout	1970	Truck, 1/2-ton, 3,900 GVW
AO975	Dodge	1964	Truck, Cargo (4 X 4), 7,000 GVW
AO977	Dodge	1964	Truck, Cargo (4 X 4), 7,000 GVW
A1009	Dodge	1972	Truck, Carryall 8 Pax, 5,400 GVW
A1010	Dodge	1974	Truck, Carryall, 1/2-ton, 5,500 GVW
A1011	Dodge	1974	Truck, Carryall, 1/2-ton, 5,500 GVW
A1012	Chev	1974	Truck, Cargo, 1/2-ton, PU, 5,000 GVW

Serial No.	Make, Model		Description
A1013	Dodge	1974	Truck, Carryall, 1/2-ton. 5,500 GVW
A1014	Dodge	1974	Truck, Carryall, 1/2-ton, 5,500 GVW
A1015	Dodge	1974	Truck, Carryall, 1/2-ton, 5,500 GVW
A1016	Dodge	1974	Truck, Carryall, 1/2-ton, 5,500 GVW
A4001	INT	1962	Truck, Van Expan
A4002	REO	1964	Truck, Van Expan
A4004	REO	1964	Truck, Van Expan
A4005	REO	1965	Truck, Van Expan
A4006	INT	1962	Truck, Van Expan
A4007	REO	1964	Truck, Van Expan
A4008	INT	1962	Truck, Van Expan
A4009	REO	1964	Truck, Van Expan
A4010	REO	1964	Truck, Van Expan
A4011	REO	1964	Truck, Van Expan
A4012	REO	1964	Truck, Van Expan
A4013	INT	1962	Truck, Van Expan
A0052		1968	Truck, Telephone, 5800 GVW
A0053		1968	Truck, Telephone Maintenance, 5800 GVW
A0054		1968	Truck, Telephone Maintenance, 5800 GVW
A0055		1968	Truck, Telephone Maintenance. 5800 GVW
A0056	IHC	1974	Truck, Maintenance, 3/4-ton
A0001	Ford	1972	Sedan, 4-door, 8 cylinder
A0003	Ford	1972	Sedan, 4-door, 8 cylinder
A0004	GM	1973	Auto Sedan, 4 door, 8 cylinder
A0005	Ford	1972	Auto Sedan, 4-door. 8 cylinder
A0006	GM	1973	Auto Sedan, 4-door, 8 cylinder
A0007	GM	1973	Auto Sedan, 4 door, 8 cylinder
A0008	Ford	1972	Sedan, 4-door, 8 cylinder
A0009	Ford	1972	Sedan, 4-door, 8 cylinder
A0010	Ford	1972	Sedan, 4-door, 8 cylinder
A0015	Amer	1969	Sedan, 6 cylinder
A0021	Ford	1971	Sedan, 4-door, 6 cylinder
A0028	Amer	1969	Sedan, 6 cylinder
A0029	Ford	1970	Sedan. 4-door. 6 cylinder
A0030	Ford	1971	Sedan, 4-door, 8 cylinder
A0031	Ford	1971	Sedan. 4-door. 8 cylinder
A0032	Ford	1971	Sedan. 4-door. 8 cylinder
A0033	Ford	1971	Sedan, 4-door, 8 cylinder
A0034	Ford	1971	Sedan. 4-door. 8 cylinder
A0035	Ford	1971	Sedan, 4-door, 8 cylinder
A0037	Ford	1970	Sedan. 4-door, 6 cylinder
A0040	Ford	1971	Sedan, 4-door. 6 cylinder
A0041	Amer	1972	Sedan. 4-door, 8 cylinder
A0042	Amer	1972	Sedan. 4-door, 8 cylinder
A0043	Amer	1972	Sedan, 4-door, 8 cylinder
A0044	Amer	1972	Sedan, 4-door, 8 cylinder
A0045	Ford	1971	Sedan, 4-door, 8 cylinder
A0101	GMC	1971	Truck, Panel, 6100 GVW
A0102	Chyrs	1972	Truck, Panel, 5300 GVW
A0104	GM	1971	Truck, Panel, 6100 GVW
A0106	GM	1971	Truck, Panel, 6100 GVW

Serial No.	Make, Model		Description
A0108	GM	1971	Truck, Panel, 6100 GVW
A0109	GM	1971	Truck, Panel, 6100 GVW
A0110	Chrys	1970	Truck, Panel, 5200 GVW
A0120	Ford	1965	Truck, Cargo, 1-ton, PU, 7000 GVW
A0122	Ford	1965	Truck, Cargo, 1-ton, PU, 7000 GVW
A0126	Ford	1970	Truck, Cargo, PU, 5000 GVW
A0127	Ford	1970	Truck, Cargo, PU, 5000 GVW
A0128	Chev	1969	Truck, Cargo, PU, 4800 GVW
A0131	Chev	1969	Truck, Cargo, PU, 4800 GVW
A0132	Ford	1970	Truck, Cargo, PU, 5025 GVW
A0133	GM	1972	Truck, Cargo, PU, 5025 GVW
A0135	Dodge	1971	Truck, Cargo, PU, 4800 GVW
A0136	Dodge	1971	Truck, Cargo, PU, 1/2-ton, 4800 GVW
A0137	Dodge	1971	Truck, Cargo, PU, 4800 GVW
A0140	Chev	1969	Truck, Cargo, PU, 4800 GVW
A0141	Ford	1970	Truck, Cargo, PU, 5000 GVW
A0143	Chev	1969	Truck, Cargo, PU, 4800 GVW
A0144	Dodge	1971	Truck, Cargo, PU, 4800 GVW
A0145	Ford	1970	Truck, Cargo, PU, 5000 GVW
A0147	Ford	1970	Truck, Cargo, PU, 5000 GVW
A0148	Chev	1974	Truck, Cargo, PU, 1/2-ton, 4800 GVW
A0149	Dodge	1971	Truck, Cargo, PU, 4800 GVW
A0151	Ford	1970	Truck, Cargo, PU, 5000 GVW
A0152	Chev	1974	Truck, Cargo, PU, 1/2-ton, 4800 GVW
A0153	Dodge	1971	Truck, Cargo, PU, 4800 GVW
A0154	GM	1972	Truck, Cargo, PU, 5025 GVW
A0155	Chev	1974	Truck, Cargo, PU, 1/2-ton, 4800 GVW
A0156	Chev	1975	Truck, Cargo, PU, 1/2-ton, 4800 GVW
A0157	Chev	1972	Truck, Cargo, PU, 5025 GVW
A0158	Chev	1974	Truck, Cargo, PU, 1/2-ton, 4800 GVW
A0159	Chev	1972	Truck, Cargo, PU, 5025 CVW
A0160	Chev	1969	Truck, Cargo, PU, 4800 GVW
A0161	Chev	1969	Truck, Cargo, PU, 4800 GVW
A0162	Chev	1969	Truck, Cargo, PU, 4800 GVW
A0163	Chev	1969	Truck, Cargo, PU, 4800 GVW
A0165	Chev	1972	Truck, Cargo, PU, 5025 GVW
A0166	Chev	1969	Truck, Cargo, PU, 4800 GVW
A0167	Ford	1970	Truck, cargo, PU, 5000 GVW
A0168	Ford	1970	Truck, Cargo, PU, 5000 GVW
A0169	Chev	1972	Truck, Cargo, PU, 5025 GVW
A0170	Ford	1970	Truck, Cargo, PU, 5000 GVW
A0171	Chev	1972	Truck, Cargo, PU, 5025 GVW
A0175	Chev	1972	Truck, Cargo, PU, 5025 GVW
A0176	Chev	1969	Truck, Cargo, PU, 4800 GVW
A0177	Chev	1969	Truck, Cargo, PU, 4800 GVW
A0179	Chev	1969	Truck, Cargo, PU, 4800 GVW
A0180	Chev	1969	Truck, Cargo, PU, 4800 GVW
A0181	GM	1972	Truck, Cargo, PU, 5025 GVW
A0182	GM	1972	Truck, Cargo, PU, 5025 GVW
A0183	Ford	1970	Truck, Cargo, PU, 5000 GVW
A0184	GM	1972	Truck, Cargo, PU, 5025 GVW

Serial No.	Make, Model		Description
A0186	Chev	1972	Truck, Cargo, PU, 5025 GVW
A0187	Chev	1969	Truck, Cargo, PU, 4800 GVW
A0188	Ford	1970	Truck, Cargo, PU, 5000 GVW
A0189	Chev	1972	Truck, Cargo, PU, 5025 GVW
A0191	Chev	1972	Truck, Cargo, PU, 5025 GVW
A0192	Chev	1972	Truck, Cargo, PU, 5025 GVW
A0193	Chev	1969	Truck, Cargo, PU, 4800 GVW
A0194	Chev	1972	Truck, Cargo, PU, 5025 GVW
A0195	Chev	1969	Truck, Cargo, PU, 4800 GVW
A0196	Chev	1974	Truck, Cargo, PU, 1/2-ton, 4800 GVW
A0197	Chev	1972	Truck, Cargo, PU, 5025 GVW
A0198	Chev	1969	Truck, Cargo, PU, 4800 GVW
A0199	Chev	1974	Truck, Cargo, PU, 1/2-ton, 4800 GVW
A0200	Chev	1974	Truck, Cargo, PU, 1/2-ton, 4800 GVW
A0201	Chev	1969	Truck, Cargo, PU, 4800 GVW
A0203	Chev	1969	Truck, Cargo, PU, 4800 GVW
A0204	Ford	1970	Truck, Cargo, PU, 5000 GVW
A0205	Chev	1969	Truck, Cargo, PU, 4800 GVW
A0206	Chev	1974	Truck, Cargo, PU, 1/2-ton, 4800 GVW
A0207	Chev	1974	Truck, Cargo, PU, 1/2-ton, 4800 GVW
A0208	Chev	1969	Truck, Cargo, PU, 4800 GVW
A0209	Chev	1974	Truck, Cargo, PU, 1/2-ton, 4800 GVW
A0210	Chev	1974	Truck, Cargo, PU, 1/2-ton, 4800 GVW
A0211	Chev	1974	Truck, Cargo, PU, 1/2-ton, 4800 GVW
A0212	Chev	1969	Truck, Cargo, PU, 4800 GVW
A0213	Chev	1974	Truck, Cargo, PU, 1/2-ton, 4800 GVW
A0214	Chev	1974	Truck, Cargo, PU, 1/2-ton, 4800 GVW
A0215	Chev	1974	Truck, Cargo, PU, 1/2-ton, 4800 GVW
A0216	Chev	1974	Truck, Cargo, PU, 1/2-ton, 4800 GVW
A0217	Chev	1974	Truck, Cargo, PU, 1/2-ton, 4800 GVW
A0220	Chev	1969	Truck, Cargo, PU, 4800 GVW
A0222	Chev	1974	Truck, Cargo, PU, 1/2-ton, 4800 GVW
A0223	Ford	1970	Truck, Cargo, PU, 4800 GVW
A0224	Ford	1970	Truck, Cargo, PU, 5000 GVW
A0228	Ford	1970	Truck, Cargo, PU, 5000 GVW
A0230	Chev	1969	Truck, Cargo, PU, 4800 GVW
A0231	Chev	1969	Truck, Cargo, PU, 4800 GVW
A0223	Ford	1970	Truck, Cargo, PU, 4800 GVW
A0224	Ford	1970	Truck, Cargo, PU, 5000 GVW
A0228	Ford	1970	Truck, Cargo, PU, 5000 GVW
A0230	Chev	1969	Truck, Cargo, PU, 4800 CVW
A0231	Chev	1969	Truck, Cargo, PU, 4800 GVW
A0233	Ford	1970	Truck, Cargo, PU, 5000 GVW
A0234	Chev	1969	Truck, Cargo, PU, 4800 GVW
A0236	Ford	1970	Truck, Cargo, PU, 5000 GVW
A0238	Ford	1970	Truck, Cargo, PU, 5000 GVW
A0239	Ford	1970	Truck, Cargo, PU, 5000 GVW
A0242	Ford	1970	Truck, Cargo, PU, 5000 GVW
A0245	Ford	1970	Truck, Cargo, PU, 5000 GVW
A0247	Ford	1970	Truck, Cargo, PU, 5000 GVW
A0254	Ford	1970	Truck, Cargo, PU, 5000 GVW

Serial No.	Make, Model		Description
A0267	Chev	1969	Truck, Cargo, PU, 4800 GVW
A0268	Chev	1969	Truck, Cargo, PU, 4800 GVW
A0269	Chev	1969	Truck, Cargo, PU, 4800 GVW
A0270	Chev	1969	Truck, Cargo, PU, 4800 GVW
A0273	Chev	1969	Truck, Cargo, PU, 4800 GVW
A0279	Amer	1970	Station Wagon
A0280	GMC	1973	Station Wagon, 3 seat
A0281	GMC	1973	Station Wagon, 3 seat
A0283	Ford	1971	Station Wagon, 3 seat
A0287	GMC	1973	Station Wagon, 3 seat
A0288	Amer	1970	Station Wagon
A0289	GMC	1973	Station Wagon, 3 seat
A0290	Amer	1970	Station Wagon
A0291	GMC	1971	Station Wagon, 3 seat
A0353	Dodge	1963	Truck, S–P, 19,000 GVW
A0450	Dodge	1965	Truck, Van, 16,000 GVW
A0451	Dodge	1965	Truck, Van, 16,000 GVW
A0453	Ford	1964	Truck, Van, 16,000 GVW
A0456	Dodge	1963	Truck, Van, Cargo, 16,000 GVW
A0458	Dodge	1970	Truck, 21,000 GVW
A0459	Dodge	1970	Truck, 21,000 GVW
A0460	Dodge	1970	Truck, 21,000 GVW
A0461	Dodge	1970	Truck, 21,000 GVW
A0462	Dodge	1970	Truck, 21,000 GVW
A0463	Dodge	1971	Truck, Van, 16,000 GVW
A0464	Dodge	1971	Truck, Van, 16,000 GVW
A0465	Dodge	1971	Truck, Van, 16,000 GVW
A0466	Dodge	1971	Truck, Van, 16,000 GVW
A0467	Dodge	1971	Truck, Van, 16,000 GVW
A0468	Dodge	1971	Truck, Van, 16,000 GVW
A0469	Dodge	1971	Truck, Van, 16,000 GVW
A0470	IHC	1972	Truck, Van, 19,000 GVW
A0471	IHC	1972	Truck, Van, 19,000 GVW
A0472	IHC	1972	Truck, Van, 19,000 GVW
A0473	IHC	1972	Truck, Van, 19,000 GVW
A0474	IHC	1972	Truck, Van, 19,000 GVW
A0475	IHC	1972	Truck, Van, 19,000 GVW
A0476	IHC	1972	Truck, Van, 19,000 GVW
A0477	IHC	1972	Truck, Van, 19,000 GVW
A0478	IHC	1972	Truck, Van, 19,000 GVW
A0479	IHC	1972	Truck, Van, 19,000 GVW
A0480	Chev	1972	Truck, Van, 19,000 GVW
A0481	IHC	1972	Truck, Van, 19,000 GVW
A0483	IHC	1972	Truck, Van, 19,000 GVW
A0484	IHC	1972	Truck, Van, 19,000 GVW
A0500	Dodge	1964	Truck, S + P (4 + 4), 19,000 GVW
A0501	Dodge	1964	Truck, S + P (4 + 4), 19,000 GVW
A0503	Dodge	1964	Truck, S + P (4 + 4), 19,000 GVW
A0504	Dodge	1964	Truck, S + P (4 + 4), 19,000 GVW
A0507	Dodge	1964	Truck, Tank Wtr (4 + 4), 19,000 GVW
A0509	Dodge	1964	Truck, Tank Wtr, (4 + 4), 19,000 GVW

Serial No.	Make, Model		Description
A0510	Dodge	1964	Truck, Tank Wtr, (4 + 4), 19 000 GVW
A0523	Ford	1968	Truck, S + P, 19,000 GVW
A0524	Chev	1966	Truck, S + P, W/C, 19,000 GVW
A0525	Chev	1967	Truck, S + P, 19,000 GVW
A0526	Ford	1968	Truck, S + P, 19,000 GVW
A0528	Chev	1967	Truck, S + P, 19,000 GVW
A0530	Chev	1967	Truck, S + P, 19,000 GVW
A0532	Ford	1965	Truck, S + P, 19,000 GVW
A0533	Ford	1968	Truck, S + P, 19,000 GVW
A0534	Ford	1968	Truck, S + P, 19,000 GVW
A0535	Chev	1967	Truck, S + P, 19,000 GVW
A0536	Ford	1965	Truck, S + P, 19,000 GVW
A0537	Chev	1966	Truck, S + P, 19,000 GVW
A0540	Chev	1966	Truck, S + P, 19,000 GVW
A0541	Ford	1968	Truck, S + P, 19,000 GVW
A0542	Chev	1967	Truck, S + P, 19,000 GVW
A0543	Chev	1966	Truck, S + P, 19,000 GVW
A0544	Ford	1965	Truck, S + P, 19,000 GVW
A0545	Chev	1967	Truck, S + P, 19,000 GVW
A0549	Ford	1968	Truck, S + P, 19,000 GVW
A0551	Chev	1966	Truck, S + P, 19,000 GVW
A0553	Chev	1966	Truck, S + P, 19,000 GVW
A0556	Ford	1965	Truck, S + P, 19,000 GVW
A0557	IHC	1972	Truck, S + P, 19,000 GVW
A0558	IHC	1972	Truck, S + P, 19,000 GVW
A0559	IHC	1972	Truck, S + P, 19,000 GVW
A0560	IHC	1972	Truck, S + P, 19,000 GVW
A0561	IHC	1972	Truck, S + P, 19,000 GVW
A0565	Chev	1972	Truck, S + P, 19,000 GVW
A0567	Chev	1967	Truck, S + P, 19,000 GVW
A0569	Chev	1966	Truck, S + P, 19,000 GVW
A0570	Chev	1966	Truck, S + P, 19,000 GVW
A0578	Chev	1967	Truck, S + P, 19,000 GVW
A0585	Chev	1966	Truck, S + P, 19,000 GVW
A0586	Chev	1967	Truck, S + P, 19,000 GVW
A0589	Ford	1968	Truck, S + P, 19,000 GVW
A0590	Ford	1965	Truck, S + P, 19,000 GVW
A0592	Ford	1965	Truck, S + P, 19,000 GVW
A0596	Chev	1967	Truck, S + P, 19,000 GVW
A0597	Chev	1967	Truck, S + P, 19,000 GVW
A0601	Ford	1967	Truck, Tank Gas, 19,000 GVW
A0602	Ford	1967	Truck, Tank Gas, 19,000 GVW
A0607	Ford	1967	Truck, Tank Gas, 19,000 GVW
A0610	Ford	1967	Truck, Tank Gas, 19,000 GVW
A0613	Dodge	1965	Truck, Tank Gas, 19,000 GVW
A0614	Dodge	1965	Truck, Tank Gas, 19,000 GVW
A0616	Dodge	1965	Truck, Tank Gas, 19,000 GVW
A0651	IHC	1965	Truck, Wrecker, 34,500 GVW
A0652	IHC	1965	Truck, Wrecker, 34,500 GVW
A0653	IHC	1965	Truck, Wrecker, 34,500 GVW
A0655	IHC	1965	Truck, Wrecker, 34,500 GVW

Serial No.	Make, Model		Description
A0659	IHC	1963	Truck, Wrecker, 34,500 GVW
A0633	IHC	1963	Truck, Wrecker, 34,500 GVW
A0670	IHC	1953	Truck, Wrecker, 36,000 GVW
A0715	IHC	1964	Truck, Tractor, 28,000 GVW
A0716	IHC	1970	Truck, Tractor, 28,000 GVW
A0717	IHC	1970	Truck, Tractor, 28,000 GVW
A0718	Ford	1967	Truck, Tractor, 28,000 GVW
A0719	Ford	1967	Truck, Tractor, 28,000 GVW
A0720	Ford	1967	Truck, Tractor, 28,000 GVW
A0721	Ford	1967	Truck, Tractor, 28 000 GVW
A0722	Ford	1967	Truck, Tractor, 28,000 GVW
A0727	Ford	1967	Truck, Tractor, 28,000 GVW
A0728	Ford	1967	Truck, Tractor, 28,000 GVW
A0730	Ford	1967	Truck, Tractor, 28,000 GVW
A0735	Ford	1967	Truck, Tractor, 28,000 GVW
A0742	Ford	1967	Truck, Tractor, 28,000 GVW
A0745	Ford	1967	Truck, Tractor, 28,000 GVW
A0747	Ford	1967	Truck, Tractor, 28,000 GVW
A0748	Ford	1967	Truck, Tractor, 28,000 GVW
A0750	Ford	1967	Truck, Tractor, 28,000 GVW
A0751	Ford	1967	Truck, Tractor, 28,000 GVW
A0754	Ford	1967	Truck, Tractor, 28,000 GVW
A0756	Ford	1967	Truck, Tractor, 28,000 GVW
A0757	Ford	1967	Truck, Tractor, 28,000 GVW
A0758	Ford	1967	Truck, Tractor, 28,000 GVW
A0759	Ford	1967	Truck, Tractor, 28,000 GVW
A0765	Ford	1967	Truck, Tractor, 28,000 GVW
A0769	Ford	1967	Truck, Tractor, 28,000 GVW
A0770	Ford	1967	Truck, Tractor, 28,000 GVW
A0773	Ford	1965	Truck, Tractor, 28,000 GVW
A0774	Ford	1965	Truck, Tractor, 28,000 GVW
A0775	Ford	1965	Truck, Tractor, 28,000 GVW
A0780	Ford	1965	Truck, Tractor, 28,000 GVW
Q0900		1972	Transporter
ED006		1961	Tractor, wheeled industrial
ED011		1971	Kettle, heat, bituminus
ED015		1970	Saw, demo, concrete
ED016		1965	Chipper, wood
ED021		1967	Tamper, buckfill
ED025		1971	Generator, 10KW
ED026		1970	Crane, Shovel, Truck, 20-ton
ED031		1951	Sprayer, insecticide
ED034		1942	Shredder, mech.
ED039		1970	Snow plow
ED040		1967	Generator 30KW
ED041		1963	Snow plow
ED042		1963	Snow plow
ED046		1959	Mixer, concrete
ED047		1973	Saw, masonry disk

Serial No.	Make, Model		Description
ED060		1973	SOD Cutter, 8 hp
ED062		1968	Sweeper, SP. vac
ED069		1971	Mower, riding
ED086		1958	Welder, 3KW
ED092		1972	Tractor, Agr. w/sickle bar
ED098		1972	Tractor, Agr. w/sickle bar
ED113		1972	Tractor, Agr. w/sickle bar
ED116		1968	Auger, earth
ED119		1965	Saw, chain
ED130		1948	Snow removal unit
ED139		1972	Tractor, Agr. w/sickle bar
ED140		1972	Tractor, Agr. w/sickle bar
ED151		1962	Generator, 15KW
ED159		1972	Tractor, Agr. w/sickle bar
ED160	Massey Ferguson	1972	Tractor, Agr.
ED161	"	1972	Tractor, Agr.
ED162		1958	Generator, 15KW
ED164		1968	Welder
ED173	Massey Ferguson	1972	Tractor, Agr.
ED175	"	1972	Tractor, Agr.
ED176	"	1972	Tractor, Agr.
ED177	"	1972	Tractor, Agr.
ED180	"	1971	Sweeper
ED186		1967	Pump, Rec. power
ED187		1971	Spreader, cinder
ED188		1971	Spreader, cinder
ED192	IHC	1969	Tractor, Agr.
ED193	IHC	1969	Tractor, Agr.
ED194		1971	Welder, 300 Amp
ED195		1970	Generator, 5KW
ED221		1953	Welder, 300 Amp
ED229		1962	Generator, 10KW
ED239	Jacobson	1963	Tractor, Agr.
ED244		1952	Roller, 58-ton
ED247	Jacobson	1968	Tractor, Agr.
ED250	Ford	1967	Tractor, Agr.
ED251		1967	Roller, 10–20 ton
ED264	IHC	1965	Tractor, Agr.
ED277		1951	Locomotive Spotter
ED284			Kettle, heating
ED289		1969	Excavator Truck
ED290		1969	Excavator Truck
ED311		1972	Spider, Tie
EO067		1970	Sweeper
EO069		1955	Sweeper
EO070		1970	Sweeper
EO071		1965	Sweeper
EO072		1970	Sweeper
EO073		1970	Sweeper

Serial No.	Make, Model	Description
EO074	1970	Sweeper
EO197	1971	Welder, 300 Amp
EO230	1968	Generator, 30KW
EO231	1968	Generator, 30KW
EO307	1959	Generator, 10KW
EO310	1959	Generator, 10KW
EO311	1959	Generator, 10KW
EO313	1959	Generator, 10KW
EO315	1959	Generator, 10KW
EO316	1959	Generator, 10KW
EO317	1959	Generator, 10KW
EO322	1959	Generator, 10KW
EO327	1962	Generator, 10KW
EO328	1962	Generator, 10KW
EO370	1970	Crane, Shovel, Truck, 20-ton
EO372	1959	Crane, Shovel, Truck, 20-ton
EO440	1962	Compressor, Rotary
EO441	1962	Compressor, Rotary
EO444	1962	Compressor, Rotary
EO445	1962	Compressor, Rotary
EO446	1962	Compressor, Rotary
EO855	1959	Crane, Shovel, Truck, 20-ton
EO858	1959	Crane, Shovel, Truck, 20-ton
EO901	1971	Tractor, wheeled, lawn, 12 hp
EO902	Minn Moline 1958	Tractor, Agr.
E1140	1961	Crane, Shovel, Truck, 20-ton
E1141	1961	Crane, Shovel, Truck, 20-ton
E1313	1959	Welder, MAC, ARC
E1318	1952	Welder, 300 Amp
E355A	1962	Generator, 7.5KW
E453A	1966	Compressor, 8CFM

APPENDIX E

Section 3
Fort Eustis, Virginia

TMP COMMERCIAL VEHICLES

ACVC	MANUFACTURER	YR	QUANTITY
	(1) Auto Ambulance		LIN No. B04294
1A0104	GMC (Oldsmobile)	73	1
1A0101	GMC (Oldsmobile)	71	3
	(2) Sedan		LIN No. B04715
1B0202	AMC	69	11
	Ford	70	14
	Ford	68	2
1B0203	AMC	72	11
	Ford	72	5
	GMC (Chevrolet)	73	8
1B0203	Ford	71	10
	(3) Auto S/W		
1C0302	GMC (Chevrolet)	73	1
	AMC	67	3
	Ford	71	2
	(4) Bus Motor		LIN No. C39696
1D0471	Checker	69	1
	Checker	73	1
1D0427	INTH	68	3
	(5) Bus Motor		LIN No. C39696
1D0426	INTH	69	2
1D0412	INTH	68	4
1D0426	INTH	70	1
	(6) Truck, Ambulance		LIN No. X38695
1H0102	Dodge	73	1
	(7) Truck, Van		LIN NO. X38365
1H0102	Dodge	72	2
	Dodge	69	1
1H0103	INTH	73	1
	(8) Truck, Cargo		LIN NO. X39598
1T1203	GMC (Chevrolet)	72	16
	GMC (Chevrolet)	74	31
	GMC (Chevrolet)	66	2
	Dodge	71	4
	GMC (Chevrolet)	69	6
	Ford	70	28
	(9) Truck, Cargo		LIN NO. X39893
1T2203	INTH	74	1
1T2204	Dodge	70	2

TMP COMMERCIAL VEHICLES (Cont'd)

ACVC	MANUFACTURER	YR	QUANTITY
	(10) Truck, C/A		LIN NO. X42064
1J1101	Ford	66	4
	Ford	65	1
	Dodge	68	4
1J1103	Dodge	69	3
	Dodge	71	1
1J1104	Dodge	72	4
	Dodge	74	1
	Ford*	75	8
	(11) Truck, Dump		LIN NO. X43589
1K1551	Ford	65	2
1K1553	INTH	70	2
	(12) Truck, Multi-Step Delivery		
1L1352	GMC (Chevrolet)	74	8
	(13) Truck, Panel		
1M1155	Dodge	72	5
	Dodge	70	1
	(14) Truck, Panel		
1M1151	Ford	65	1
	Ford	66	1
	Ford	67	3
	(15) Truck, Stake		
101301	INTH	74	4
	Dodge	70	1
	Ford	66	13
	GMC (Chevrolet)	67	3
101304	Dodge	69	4
	INTH	70	15
	(16) Truck Tanker		
1P1651	Dodge	70	1
	Ford	64	1
1P1653	Ford	67	1
	GMC (Chevrolet)	66	1
1P3652	INTH	63	1
	INTH	65	4
	(17) Truck, Tractor		
1Q1504	Ford	67	5
	Ford	65	2
	INTH	64	1
	INTH	70	3
	INTH	66	5

TMP COMMERCIAL VEHICLES (Cont'd)

ACVA	MANUFACTURER	YR	QUANTITY
	(18) Truck, Utility		
1R70501	Jeep	73	5
	Jeep	72	2
	INTH	70	2
	(19) Truck, Van Cargo		
1S1401	INTH	71	3
	Dodge	67	3
	Dodge	70	2
1S1402	INTH	71	1
	(20) Truck, Wrecker		
1T3602	INTH	66	1
	INTH	65	1

INVENTORY POST ENG

ACVC	MANUFACTURER	YR	QUANTITY
	(1) Trk, 3/4 ton, Maint Utility		
	INTH	74	45
	INTH	72	15
	Dodge	70	29
	(2) Trk, Line Maint		
	Ford 1 ton	68	1
	INTH 2½-ton	67	1
	INTH 5 ton	73	1
	(3) Trk, Dump 5 ton		
	INTH	65	2
	INTH	69	1
	(4) Trk, Maint Utility		
	Ford, 1½ ton	67	1
	Ford, 2½ ton	68	1

504TH MP'S

ACVC	MANUFACTURER	YR	QUANTITY
1M1156	Dodge	74	1
111203	GMC (Chevrolet)	74	1
1B0203	Ford	73	3
1B0203	Ford	72	8
1B0203	Ford	71	11
1B0203	AMC Rambler	72	1

EQUIPMENT LIST

Type Equipment	Quantity
Air Compressor	30
Generators:	
1.5 to 25 kw (150 1.5 to 5.0)	162
Portable Heaters (400,000 BTU Units)	7
Tank & Pump Units (600 gal tank w/liquid pumps)	14
Welders (Portable)	13
Warehouse Tractors (Tugs)	20
Forklifts (2000 to 15,000 lbs)	115
Pumps (Liquid)	22
Lubrication servicing units (Portable)	1
Cranes	4
Insecticide Sprayer	1
Hydraulic Test Stand	9
Lawn Mowers	225
Outboard Motors	41
Industrial Tractors	29
Escalators (Road equipment)	2
Road Rollers	1
Road Sweepers	2
Vac-all	2

TACTICAL VEHICLES

All tactical vehicles at Ft. Eustis are assigned to the 7th Group. There are 117 vehicles, however, a breakdown by vehicle type and model is not available.

APPENDIX E

Section 4
Fort Carson, Colorado

A breakdown of all vehicles and other gasoline powered equipment used during this unleaded gasoline evaluation program at Ft. Carson, Colorado is not available. For density of commercial, tactical, and combat vehicles, see Table 1.